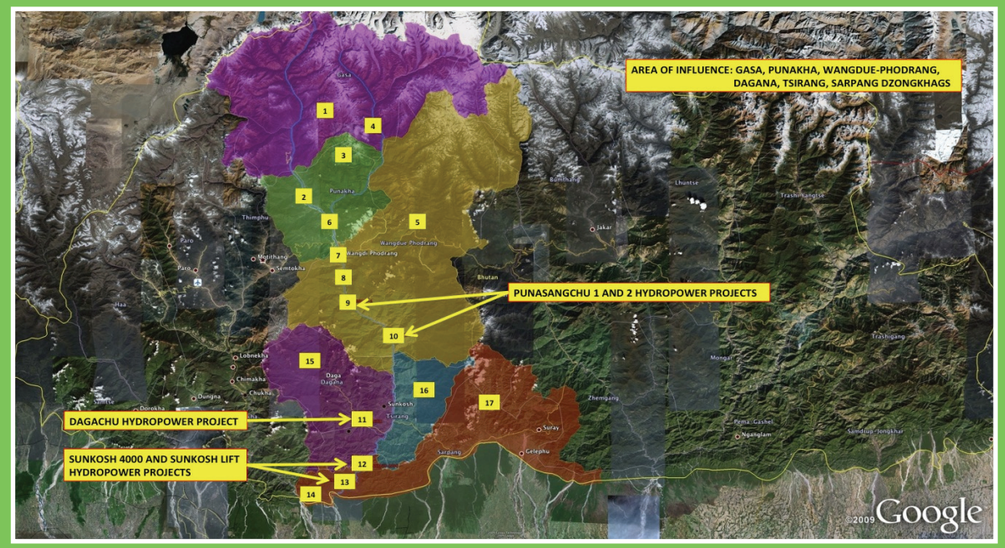
ROYAL GOVERNMENT OF BHUTAN

PROSPECTIVE STRATEGIC ASSESSMENT OF: PROPOSED HYDROPOWER PROJECTS ON BASIN-2 (WATERSHED OF THE PUNASANGCHU RIVER)



GROSS NATIONAL HAPPINESS COMISSION

NATIONAL ENVIRONMENT COMMISSION

NATIONAL LAND COMMISSION

PREAMBLE

The Strategic Assessment (SA) Report is prepared to identify the wider development impacts expected from the development of mega-hydropower projects planned for Basin-2 (the Punasangchu River Basin). The report identifies expected development impacts and introduces measures to effectively manage and mitigate forecasted negative environmental, social and economic impacts while introducing measures to reinforce expected positive impacts expected from the developments.

The foundation of the Report is the agreed SA Objective and, as such, the report ventilates the Objective into sub-objectives relative to themes and sectors (Topics) agreed by stakeholders. These cover environmental, social, cultural, economic and global (climate) dimensions.

The SA Report is the key consultation document detailing the SA process and its outcomes. As such, the document is a stand-alone document that serves to inform government authorities, stakeholders and the general public.

COVER NOTE

The attached Strategic Assessment Report has been prepared for:

HYDROPOWER DEVELOPMENTS PLANNED FOR BASIN-2

The Responsible Authority is:

CONTACT	Mr. SONAM YANGLEY – DIRECTOR GENERAL - NECS MR. KARMA TSHITEEN-SECRETARY – GNHC DASHO SANGAY KHANDU-SECRETARY - NLC
ADDRESS	
TEL. No	
E-MAIL	

SIGNATURE	FOR THE GNHC FOR THE NEC FOE THE NLC
DATE	

Figure-1: MAP OF BHUTAN

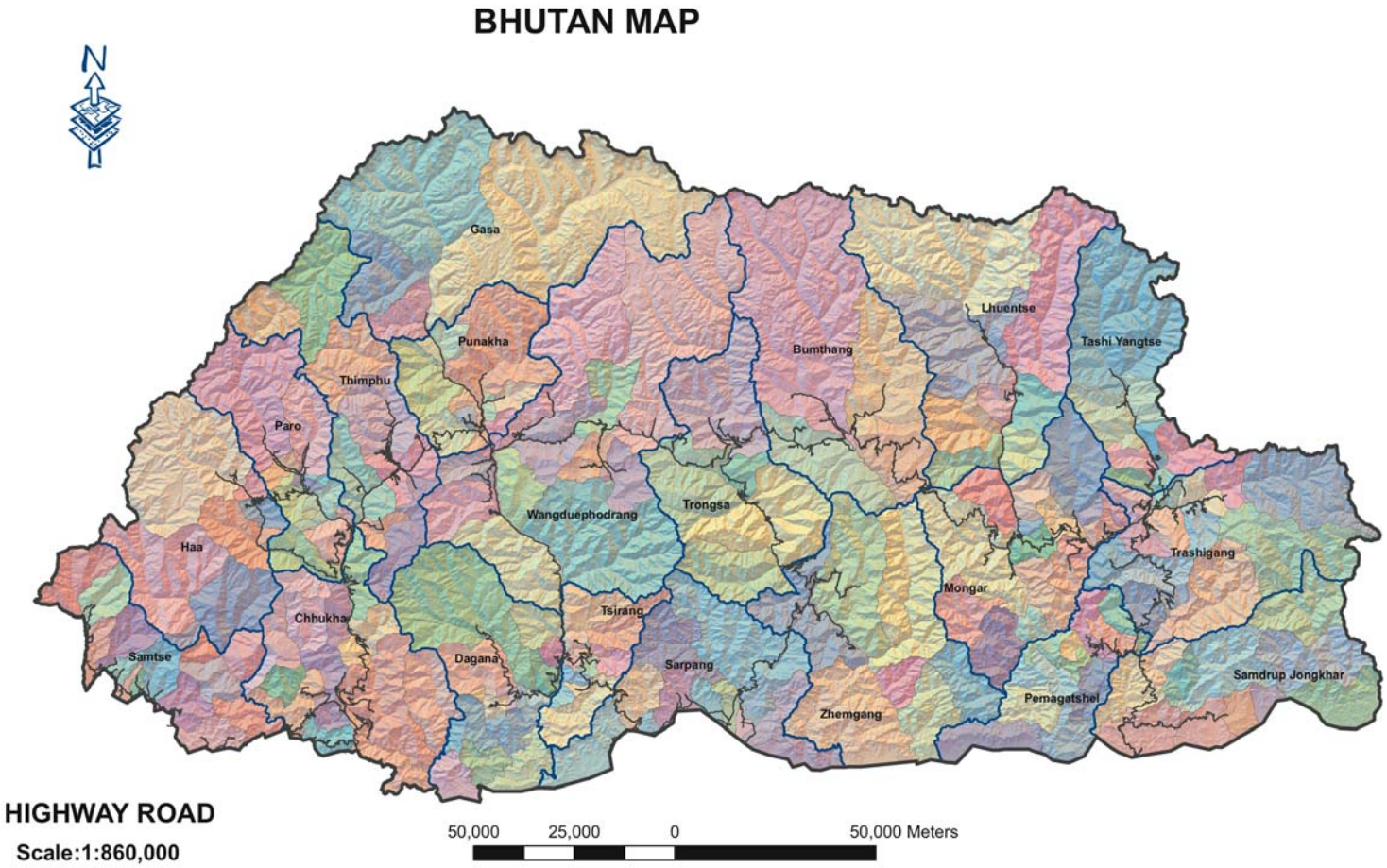
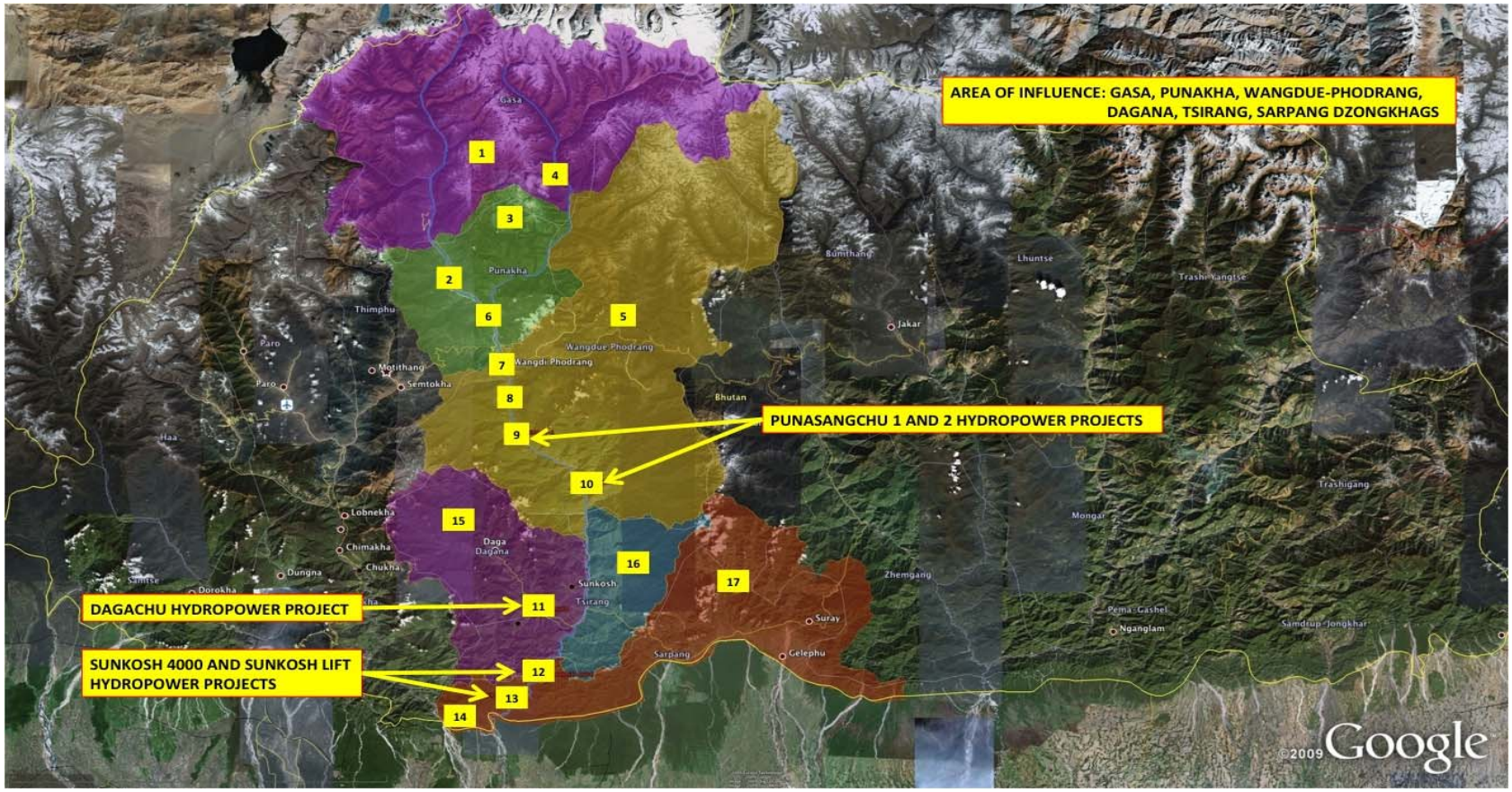


FIGURE-2: LOCATION MAP OF BASIN-2 AND SITES OF PROPOSED HYDROPOWER DEVELOPMENT SITES



The legend for Figure-2 is described in Section-5.5 of this Report.

AREA OF INFLUENCE AND FOCUS AREAS CONSIDERED DURING THE STRATEGIC ASSESSMENT

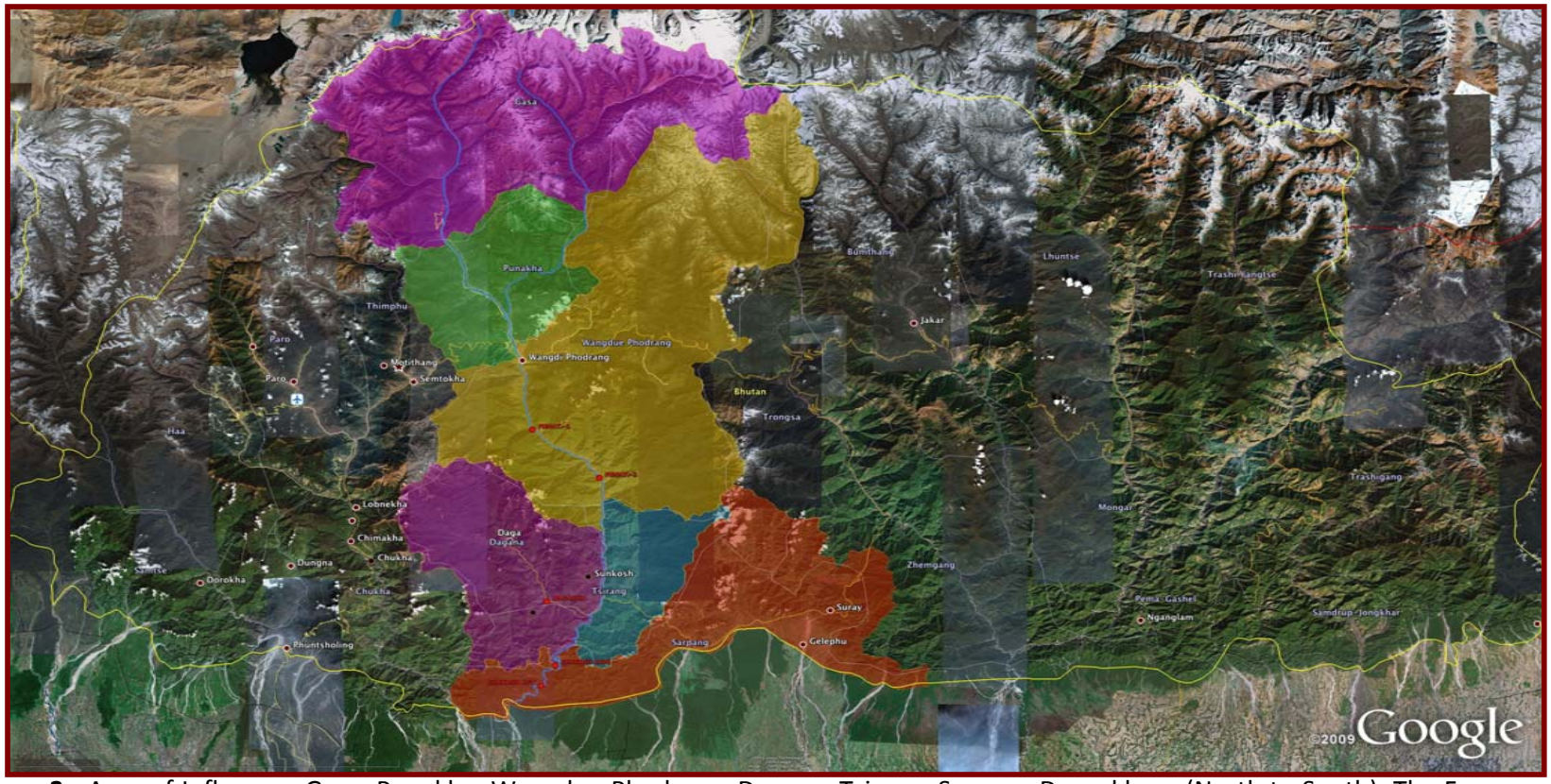


Figure-3: Area of Influence: Gasa, Punakha, Wangdue-Phodrang, Dagana, Tsirang, Sarpang Dzongkhags (North to South). The Focus area was selected as two linked areas: to the North Punakha and Wangdue-Phodrang and the second in the Southern region of Dagana, Sarpang and Tsirang Dzongkhags.

TABLE OF CONTENTS

ACRONYMS

CSR	**Corporate Social Responsibility**
DANIDA	**Danish International Development Assistance**
DEC	**District Environmental Committees**
DoE	**Department of Energy**
DoF	**Department of Forestry**
DoR	**Department of Roads**
DEO	**District Environmental Officer**
DRM	**Disaster Risk Management**
DRR	**Disaster Risk Reduction**
EFRC	**Environment Friendly Road Construction**
EIA	**Environment Impact Assessment**
FYP	**Five Year Plan**
GDP	**Gross Domestic Product**
GIS	**Geographic Information System**
GNH	**Gross National Happiness**
GNHC	**Gross National Happiness Commission**
GLOF	**Glacial Lake Outburst Flood**
GoI	**Government of India**
ICDP	**Integrated Conservation and Development Programme**
IEE	**Initial Environment Evaluation**
JDMP	**Jigme Dorji National Park**
LDC	**Least Developed Country**
LLDC	**Landlocked - LDC**
MDG	**Millennium Development Goals**
MEA	**Multilateral Environmental Agreement**
MSME	**Micro, Small and Medium Enterprises**
MoA	**Ministry of Agriculture**
MoEA	**Ministry of Economic Affairs**
MoE	**Ministry of Education**
MoF	**Ministry of Finance**
MoH	**Ministry of Health**
MoHCA	**Ministry of Home and Cultural Affairs**
MoWHS	**Ministry of Works and Human Settlement**
MW	**Megawatt**
NBC	**National biodiversity Centre**
NEC	**National Environment Commission**
NECS	**National Environment Commission Secretariat**
NSB	**National Statistics Bureau of Bhutan**
NSDS	**National sustainable Development Strategy**
NSP	**National Strategic Plan**
Nu	**Ngultrum**
NUS	**National Urbanization Strategy**

OECD	**Organization for Economic Cooperation and Development**
RBC	**River Basin Committee**
RBM	**Results Based Management**
RGoB	**Royal Government of Bhutan**
RNR	**Renewable Natural Resource**
RSPN	**Royal Society for Protection of Nature**
SA	**Strategic Assessment**
SAARC	**South Asian Association for Regional Cooperation**
SEA	**Strategic Environmental Assessment**
SD	**Sustainable Development**
WWF	**World Wide Fund for Nature**

ACKNOWLEDGEMENTS

The SEA/SA process by definition is an issues-driven participative approach to the environmental assessment of plans, policies, programmes development proposals or complex projects. In this regard, the contributions of the participants at the two workshops must be acknowledged, as their inputs were invaluable to the SEA exercises. It must also be appreciated that the SEA report below is an output of their hard work at the two weeklong workshops in Wangdue and Paro. The list of participants at the workshops is attached to the report and we would like to acknowledge them as available national capacity for future SEAs in Bhutan. The participants included a diverse mix of capacities (from Gewog Administrative Officers to Dasho Dzongdags to Senior Officers from stakeholder agencies) who discussed issues candidly and deliberated long hours to emerge with workable solutions and alternatives aimed at mitigating the negative environmental impacts of the proposed development while at the same time enhancing socio-economic opportunities for the people living in the area of influence. We would like to acknowledge their hard work as the primary input to this SEA.

Acknowledgements are also due to Mr. Michael Pearson for his dedication and patience as Technical Expert for the SEA exercise. The advantage of this SEA is that the consultants introduced the technical aspects of the exercise and then only guided the workshop participants through the various stages of the process. Therefore, the strength of this SEA is that it is a true national endeavour. Mr. Michael Pearson's patience in sharing his experience and guiding the participants without overly intervening in the process was remarkable.

We would also like to acknowledge Mr. Tandin Dorji for his services as local consultant. Mr. Tandin Dorji not only participated and contributed to the process but also gained valuable experience and know-how about the SEA process through his association with the technical expert. We are hopeful that he will continue to contribute as a national resource for future SEAs in Bhutan.

Acknowledgements are also due to the following officers from the National Environment Commission: Mr. Thinley Dorji who coordinated the workshops; Mr. Tshewang Dorji who managed the process intermittently while also playing a vital part in the SEA workshops; Mr. Tshewang Chaskar for all the administrative and logistical arrangements; Mrs. Kesang Dema for taking care of the financial aspects of the project; Mrs. Pema Lhazom for taking care of the secretarial needs of the project; and Mr. Karma Tshering for managing the entire process.

We would also like to take this opportunity to express our gratitude to Dasho Nado Rinchhen, who as Head of the NEC then, provided much guidance and

impetus to entire process. Without his encouragement and motivation, it would not have been possible to gather such a diversity of experts for the two SEA workshops. Our acknowledgements also go out to Dasho Paljor J. Dorji, Advisor to the National Environment Commission, for gracing the opening of the SEA workshops and for inspiring the participants to input their experiences in the overall exercise. We would also like to acknowledge Mr. Sonam Yangley, Director General, NEC, for ensuring the continuity of the SEA process through the discussion of the report at the national level.

We would also like to acknowledge the Gross National Happiness Commission (GNHC) and the National Land Commission (NLC) for their cooperation in this endeavour. We want to highlight that these two partner agencies play strategic roles in the SEA process and the spirit of cooperation extended for this SEA was commendable. Acknowledgements are also due to the NLC for providing the maps for the SEA exercises.

Lastly, we would like to acknowledge and express our gratitude to DANIDA for providing the financial assistance to undertake the SEA. We remain confident that this SEA will contribute to the integration of environmental considerations into Policies, Plans and Programmes of the Royal Government of Bhutan while evaluating their inter-linkages with economic and social considerations.

EXECUTIVE SUMMARY

This Report describes the process, outcome, and recommendations of a Strategic Assessment to identify and consider the wider development impacts (Environmental, socio-economic and GNH) of planned hydropower investments in Basin-2 and particularly on the Punasangchu and Dagachu Rivers. The planned hydropower development projects on Basin-2 Rivers have been inscribed and prioritised in the Tenth Five Year Plan (2008-2013).

The point of departure for this Strategic Assessment was agreement (among stakeholders) that each hydropower project is an agent of development and change. As such, the cumulative development impact of all planned hydropower projects are expected to be significant and transformative at local, regional, national and trans-national levels.

This Report describes the Strategic Assessment Process carried out to consider the best possible development alternative(s) targeting two selected focus areas where development catalysed by the hydropower projects are expected to concentrate. A northern focal area considers development in an area extending from Gasa and Punakha Dzongkhags to the north and south to the site of the Punasangchu-1 hydropower project. A southern focal area considers forecasted development of Lhamoizingka, southern Dagana Dzongkhag, Western Sarpang and Tsirang Dzongkhags. The Report considers the environmental and socio-economic impacts and benefits of each proposed development alternative and details consultative and participatory methods used to select a preferred alternative, identify negative impacts that could be expected from the selected alternative(s) and proposes management and mitigation measures necessary to offset negative impacts and optimise overall development benefits accrued to the selected area of influence (Figure-2) the focus areas and to the Kingdom of Bhutan.

The Strategic Assessment of planned hydropower developments on Basin-2 Rivers is aligned to Article 5 of the Constitution of the Kingdom of Bhutan (2008), The National Environment Protection Act of Bhutan (2007), the Regulations for the Environmental Clearance of Projects and the Regulations on Strategic Environmental Assessment (2002).

The rationale of this Strategic Assessment was to:

- Introduce a mechanism to fully consider development consequences and impacts of planned hydropower developments on Basin-2 Rivers over a 20-year temporal framework;

- Ensure that potential negative impacts and risks expected from induced development and future investments catalysed by the hydropower projects have been identified and fully considered and

inform development planning of both the focus areas and the selected area of influence;

- Consider the cumulative effects of the proposed policy, plan, programme or development proposal (in this case the planned hydropower investments) on a local, sectoral, regional, national or trans-national perspective.

- Propose management and mitigation measures to minimise the environmental and socio-economic consequences of identified negative impacts;

- Select development alternatives that best meet the present and future needs of affected Dzongkhags and their people;

- Support development planning and decision/making in the focus areas, Dzongkhags and the Area of Influence that are affected directly or indirectly by hydropower development projects (mega-projects).

The Strategic Assessment Process:

In 2002, the National Environment Commission enacted its Regulations on Strategic Environmental Assessment of Policies, Plans and Programmes as per the articles and provisions of the Environmental Assessment Act of 2000. These Regulations were not put into practice given that Line Ministries considered that the enacted Regulations would lead to delays in Government processes and therefore impede development. Since then, the Regulations have been kept on standby but agreement was reached that they would be activated and applied, as necessary, to proposed "*mega-projects"* of national significance. As such, the hydropower mega-projects on the Punasangchu and Dagachu Rivers meet agreed assessment criteria.

The present Strategic Assessment was tailored to the specific needs of the Royal Government of Bhutan represented by: The National Environment Commission and Secretariat; the Gross National Happiness Commission; the National Land Commission; Stakeholder Dzongkhags and key Line Ministries.

The methods used were a composite of: The OECD/DAC methodology as described in their *Good Practice Guidance* (2006); the United Nations University Course Modules on SEA of 2006; GTZ-SEA guidance; Danida guidance on SEA applications; the Experience of the Scottish Executive detailed in their SEA Toolkit (2006); the guidance provided by the International Association of Impact Assessment (IAIA) and personal SA application experience of the Process Facilitator (Michael P. Pearson PhD. Danida Technical Advisor to NECS)

The OECD-DAC, SEA Task Team (2006) defined Strategic environmental Assessment Processes as:

"*A range of analytical and participatory approaches that aim to integrate environmental considerations into Policies, Plans and Programmes and evaluates their inter-linkages with economic and social considerations*"

The SEA/SA process by definition must therefore be an issues driven participative approach to the environmental assessment of plans, policies, programmes development proposals or complex projects. Furthermore, it should contribute to sustainable development through the assessment of strengths and weaknesses and environmental resources, which can support or be detrimental to development.

The stages of the Strategic Assessment Process:

SCREENING: Any Policy, Plan, Programme or Complex Development Project likely to engender environmental, social or economic impacts qualifies for analysis through a Strategic Environmental Assessment (SEA) / Strategic Assessment (SA) Process. The planned hydropower development projects on Basin-2 (including all essential and strategic infrastructure) are both an agent of change and a development catalyst. As such, they will engender significant positive, negative and cumulative impacts that can be mitigated or optimised through effective SA process implementation.

Gross National Happiness Commission, the National Environment Commission and the National Land Commission agreed that planned priority hydropower mega-projects on Basin-2 would have significant and wide-ranging development consequences coupled to multiple point-source and cumulative environmental, social, economic and GNH impacts.

In order to better understand the nature and range of expected development and effectively manage identified impacts it was agreed that the most appropriate tool would be a Strategic Assessment.

The National Environment Commission was instructed to lead the Strategic Assessment Process on behalf of the Gross National Happiness Commission and to include the National Land Commission as its Process Partner.

SCOPING: Scoping, or Context Setting, introduced all stakeholders to the SA process During this stage: The objectives of the SA were agreed; The organisational and operational framework of the assessment were described; The spatial/geographic scope of the assessment was agreed; The temporal framework to be considered during the assessment was agreed (T-0 to T+20-years); Priority themes to be considered during the assessment were identified (i.e. Climate change; Tourism; Industry and Trade; Migration; Poverty; Cultural dilution; HIV/AIDS; etc.); Options and alternatives that were

considered during the Assessment were agreed by process stakeholders and a framework for the introduction of additional stakeholder alternatives was prepared; Information needs and sources of information were identified; Existing sector plans specific to the spatial context of the assessment were identified and requested; A steering or platform group (the Training materials necessary to the Assessment Phase were prepared.

This stage of the Assessment process was carried out through site visits to concerned Dzongkhags, discussions with Dzongdags, Dzongkhag Environmental Officers, and officers from concerned central administrations. In addition, existing information sources were identified from the Ministry of Agriculture, The Ministry of Works and Human Settlement, GNHC, the NECS, the NLC, Ministry of Economic Affairs and others.

Process design was also detailed during the Scoping stage and later validated by Process participants during the first Workshop.

IDENTIFICATION AND ASSESSMENT OF ALTERNATIVES: Alternatives to be considered and analysed during the Process were identified and selected by Process participants/stakeholders. All alternatives proposed by the floor during plenary sessions were initially retained. Participants reduced the number of proposed alternatives through discussion and vote. Only those Alternatives retained were analysed through scenario construction, risk analysis and expert judgement.

SELECTION OF THE PREFERRED ALTERNATIVE: On completion of the prospective analysis through scenario construction and expert judgement, participants presented their analysis to the floor in a plenary session. A plenary discussion and debate on the outcomes of each analysis led to the selection of a preferred alternative(s).

IMPACT IDENTIFICATION AND ASSESSMENT: The technical group /process participants were then requested to detail each development action likely to comprise the preferred alternative over the temporal and geographic scope of the Assessment.

Environmental, social, economic and GNH impacts (point source and cumulative) expected from each development action were then identified together with requisite management and mitigation necessary to offset the predicted effect.

Projected development was then plotted as polygons on maps and Google-Earth images. Though this is a low resolution mapping exercise, it was sufficient to address issues of compatibility and spatial relationships both in the focal area and the identified area of influence.

THE STRATEGIC ENVIRONMENTAL ASSESSMENT REPORT: The results of the Assessment Phase are complied to prepare this Draft SEA Report. The Report is then subjected to a further stakeholder consultation and validation procedure and adjusted as necessary to prepare the Final SEA Report.

ADOPTION AND RECORD OF DECISION: Once the Report has been adjusted and validated by the joint Commissions, a Statement of Endorsement is prepared and submitted by the joint Commissions to their Chairman.

The Statement of Endorsement is an official document that serves to instruct central and lower tiers of government to introduce mainstreamed Process results and outcomes to their future plans. It also instructs government to act on Process recommendations.

PROCESS ORGANISATION:

The Strategic Assessment was initiated by the National Environment Commission Secretariat and led jointly by the NEC, the GNHC and the NLC on behalf of the GNHC. The Strategic Assessment was organized as follows:

The Joint Commissions lead the process and comment on the results of the Technical Group responsible for contributing towards the successful conclusion of the different stages of the Process. The Joint Commissions receive the Strategic Assessment Report, provide comments and finally recommend endorsement of the Report.

The Endorsed Report is then delivered to concerned Dzongkhags with instructions to introduce mainstreamed outcomes to their future development plans.

A Technical Group comprising representatives of all stakeholder groups (Central Government, Concerned Dzongkhags, Geogs, Experts, the General Public, NGO's, Associations, etc) was called to participate in the process. The Technical Group was provided with training and support to enable them to contribute effectively to the process.

The Technical Group was asked to participate in two consultative workshops during which objectives were agreed, alternatives identified and selected, impact assessment was carried out and management/mitigation measures identified and outcome recommendations drafted. As such, the Technical Group was critical and key to the successful outcome of the Process.

PROCESS OBJECTIVE AND SUB-OBJECTIVES:

The Objective of the SA was determined through stakeholder discussions during the Scoping Stage of the SEA. Stakeholders approved the Objective during the 1st Stakeholder Workshop held in Wangdue from the 31st of

August to the 5th of September 2009. Sub-objectives were derived from the Objective and formulated to address the critical themes to be addressed during the Assessment Process.

THE OBJECTIVE OF THE STRATEGIC ASSESSMENT:

Process Stakeholders agreed that the Objective of the Strategic Assessment to assess the overall development impacts expected from hydropower investments on Basin-2 would be:

"To analyse through relevant stakeholder and public participation, a number of alternative development scenarios expected from investments in Projects on Basin II to enable the selection of optimal solutions delivering maximum sustainable (GNH) benefits of Bhutan while minimizing the cumulative impacts of that development".

THE SUB-OBJECTIVES OF THE ASSESSMENT PROPOSED BY PROCESS STAKEHOLDERS:

As noted previously, sub-objectives were formulated relative to the principal topics and themes to be considered during the assessment. These have been extracted from section 4.4 of the Report and are presented below:

1. **Climate Change:** Development planning and associated investments in the area of influence of Basin-2 hydropower investments are directed and planned taking into consideration risks and cumulative impacts expected from climate change and systematically introducing mitigation and management measures.

2. **Watersheds and Catchment Basins:** Catchment basins and water supplies are mapped, inventoried and effectively managed to ensure continued delivery of critical ecosystem services to downstream users and the State.

3. **Economic Development:** Economic and urban development of Dzongkhags and Geogs directly affected by investment in Basin-2 hydropower developments is planned, coherent, sustainable and, as such, does not impact negatively on the population, the environment and conserves inter-generational equity.

4. **Tourism, Eco-tourism and Tourism Services:** Development of tourism assets and opportunities in the area of influence of Basin-2 hydropower developments are identified, zoned, promoted, developed sustainably and contribute to national, regional and local development plans (within the principles of GNH).

5. **Environment (Pollution control, Waste Management, Water Management, Biodiversity and Natural Assets):** Investments and developments in the Basin-2 area are integrated into the natural

environment / Landscape by giving a high priority on the quality and limitations of ecosystems in the area of influence and minimizing negative environmental impacts.

Biodiversity inventoried in the area of influence of planned Basin-2 hydropower investments is enhanced and actions leading to irreversible losses are prevented.

6. **Social Infrastructure:** Improving the livelihood of the people by providing better heath services, education, employment opportunities, recreational facilities, better communication and financial services.

7. **Agriculture and Forests: Ensure minimum loss of agricultural land and Government Reserve Forest lands while ensuring an adequate supply of land for all future demand as per the relevant laws of the Kingdom.**

8. **Culture and Heritage:**
   - **A.** Cultural heritage values and sites are protected and promoted as social, historical and economic assets.
   - **B.** Cultural heritage and cultural fabric in the areas of influence is not affected by the development and migration/displacement have minimum negative impacts

9. **Security:** Measures to enhance existing security relationships with neighbour states to ensure that security risks do not erode economic/social development options and potential**.**

ALTERNATIVE DEVELOPMENT OPTIONS CONSIDERED:

Alternative-1: Wangdue-Punakha (including Gasa) develops as a tourism as well as services hub. Southern focal area develops as a tourism and industrial area.

Alternative-2: The Wangdue Punakha focal area develops as a manufacturing centre. The southern focal area is developed for agro-industries and trans-boundary trade centres.

Alternative-3: Wangdue-Punakha develops as a major urban centre with international and national standard services in tourism and a focus on East-West South distribution hub. The southern area is developed as an entry port and SEZ/Industrial area.

Alternative-4: Wangdue-Punakha services international and national tourism and is an East-West-South trade and distribution hub. The Southern focal area is developed as a Special Economic zone and industrial area.

Descriptions for each of the proposed alternatives are provided in section 5.2 of the Report.

THE PREFERRED ALTERNATIVE: The preferred alternative selected by Process participants was the result of discussion and analysis of all proposed alternatives. Stakeholders agreed to merge Alternatives 3 and 4 to formulate their preferred development option. As such, the preferred alternative as formulated by Process stakeholders is as follows:

PREFERRED ALTERNATIVE (*Merged Alternatives 3 and 4)*
WANGDUE-PUNAKHA AND GASA DEVELOP INTERNATIONAL AND NATIONAL STANDARD SERVICES IN TOURISM WITH WANGDUE-PUNAKHA AS A MAJOR URBAN CENTRE (CONURBATION). **THE SOUTHERN FOCAL AREA DEVELOPS AS A TOURISM AND INDUSTRIAL AREA, SPECIAL ECONOMIC ZONE AND ENTRY PORT.**

REJECTED ALTERNATIVES AND RATIONALE FOR REJECTION: Rationale for selection and rejection of the various proposed alternatives are presented below. The text has been extracted from Section 5.3 of the Report.

Alternative-1: Wangdue-Punakha (including Gasa) develops as a tourism as well as services hub. Southern focal area develops as a tourism and industrial area.

Process participants **rejected** the alternative given that it did not include sufficient elements to fully capitalise on development opportunities in both the focal areas and the overall area of influence considered in this assessment.

Participants also considered that the alternative was missing critical connectivity to external and internal markets provided by the establishment of a “dry port” at Lhamoizingka (Alternative-3).

Alternative-2: Wangdue-Punakha is developed as a light industry and manufacturing area. The southern focal area is developed for agro-industries and trans-boundary trade centres.

Process participants **rejected** the alternative on the basis that it did not consider that the attributes and comparative advantages of the area would be best served if development focused solely on industry and manufacturing.

Participants considered the alternative missed the tourism dimension.

Alternative-3: Wangdue-Punakha develops as a major urban centre with international and national standard services in tourism and a

focus on East-West South distribution hub. The southern area is developed as an entry port and SEZ/Industrial area.

The Alternative was **retained and merged with Alternative-4** below to elaborate the preferred alternative detailed in section 5.4 of this report.

Participants considered that Wangdue-Phodrang and Punakha would merge into a large urban area within the 20-year temporal framework of the assessment.

Participants also considered that establishment of a "dry port" in Lhamozingkha (Kalikhola) would be likely within the temporal framework of the assessment. Furthermore, participants considered that a "dry port" would significantly enhance economic development opportunities of the central Dzongkhags (the area of influence).

Alternative-4: Wangdue-Punakha services international and national tourism and is an East-West-South trade and distribution hub. The Southern focal area is developed as a Special Economic zone and industrial area.

Process participants chose to **retain** this alternative and voted to merge Altrnative-4 to Alternative-3.

The merged preferred alternative is detailed below in section 5.4 of this Report.

THE PRINCIPAL FORECASTED NEGATIVE IMPACTS EXPECTED FROM THE PREFERRED ALTERNATIVE:

Process participants/stakeholders considered the preferred alternative relative to the development expected from it. As such they characterised negative impacts relative to broad scale development foci. These included:

Urban expansion: The development scenario foresees rapid expansion of the Wangdue-Punakha urban areas and gradual expansion Lhamoizingka in line with the establishment of a Special Economic Zone, Industrial Estates and expanded adjacent agricultural areas. Likewise, the preferred development option forecasts expansion of Tsirang, Sarpang, Gelephu, Damphu and Daga. Though urban growth is forecast in all existing urban areas, the principal expansion will be in Wangdue-Punakha that will absorb all villages between Punakha and Wangdue and Lhamoizingka during the latter stages of the 20-year temporal framework.

Expansion is expected to generate significant volumes of solid waste and wastewaters in line with increased commercial activities and increasing population as employment generation from tourism, service, and light

manufacturing industries becomes apparent over the 20-year temporal framework of the Assessment.

Expansion will also result in a de-facto increase in land transformation that will call for conversion of government reserve forests and agricultural land in both the north and south focal areas. Resettlement of existing populations is likely and will be required over the 20-year temporal framework of the Assessment. Stakeholders also considered that forecasted urban expansion and population growth would result in significant depletion of natural resources (aggregates, stone, wood products, etc.) as demand for building materials increased and that extraction could lead to alteration of existing landscape values.

Stakeholders considered urban expansion would lead to an increased incidence of water pollution and contamination of potable water sources. In addition to these impacts, stakeholders considered that urban expansion would also result in increased air pollution, noise pollution, depletion of natural resources, increased incidence of communicable diseases and prevalence of HIV/AIDS.

Tourism Sector: The preferred alternative forecasts a significant expansion in tourism facilities, tourism support services and infrastructures in both the northern focal area concentrated around the Punakha-Wangdue conurbation and the southern focal area concentrated in Lhamoizingka, the periphery of the Phibsoo Wildlife Sanctuary and the shorelines of the Sunkosh reservoirs.

While expansion of the tourism sector will enhance environmental management throughout the area of influence and lead to increased employment/income generation, it is also foreseen that the construction and operation of tourism facilities could also result in significant negative environmental and socio-economic impacts that will demand proactive and continuous management and mitigation.

Negative impacts identified by Process stakeholders included: a significant volume of solid wastes and spoils generated during construction and then operation of tourism facilities; Increased water consumption and generation of wastewater requiring treatment; possible contamination of ground water potable water supplies; land transformation of depletion of critical natural resources; possible increased air pollution and increased incidence of communicable diseases**.**

Transport Sector: Process participants forecast a rapid expansion of transport infrastructure over the 20-year temporal framework of the assessment. These included: Construction of a trunk road (aligned on the eastern banks of the Punasangchu River to Sunkosh Bridge) linking Lhamoizingka to Wangdue-Punakha-Thimphu and the Eastern Dzongkhags; Expansion of the feeder road and farm road networks throughout the area of influence; Construction of a road tunnel linking Wangdue-Punakha to Thimphu; Development of water-based transport and ferry crossings on and

across the Sunkosh reservoirs; Construction of a regional airport at Lhamoizingka and construction of a trans-Bhutan railway (aligned parallel to the border with India) and linking Sibsoo (Samtse Dzongkhag) to Jampani (Trashigang Dzongkhag).

Identified negative impacts included: Generation of spoils requiring adequate disposal; Land transformation; depletion and fragmentation of natural resources and critical ecosystems/habitats; pollution of groundwater sources, increased emissions resulting in localised air pollution; accidental spillage of fuels and oils; illegal dumping of transport wastes including hydrocarbons; Pollution of surface waters and potable water sources; altered biodiversity inventories; ribbon development adjacent to constructed infrastructures; increased prevalence of HIV/AIDS.

Agriculture and Fisheries Sector: Process stakeholders considered that the preferred alternative would lead to expansion and diversification of agricultural production in the area of influence. They also forecast a significant increase in commercial farming practices and expansion of agro-based industrial output. Construction of the Sunkosh Reservoirs could also see growth of the fisheries sector through the establishment of commercial and artisanal fish farms on, or adjacent to the reservoirs.

Negative impacts expected from sector growth and development could include: Significant demand for agricultural land and expansion of rural settlements would lead to increased transformation of existing government reserve forests; Deforestation; Fragmentation of critical habitats; Increased bank erosion throughout the basin leading to increased sediment loads, and impacted riverine biodiversity; Pollution of rivers, watercourses, ground water and near surface water supplies resulting from increased use of fertilizers and pesticides and depleted biodiversity inventories.

Industrial Sector: Negative impacts forecast for the Industrial Sector included: Increased production of solid waste that could include contaminated waste, organic waste (from agro-Industries and abattoirs; Wastewater requiring special treatment to remove toxic materials and heavy metals; increased production of gaseous emissions; Noise pollution in the vicinity of industrial facilities; Depletion of natural resources; natural resource and habitat fragmentation; Cultural dilution and increased vandalism of cultural heritage sites; Increased incidence of communicable diseases and HIV/AIDS; increased rural migration and a concomitant depletion of rural communities and available workforce.

Mining Sector (Mines and Quarries): Process participants agreed that improved access infrastructures in the area of influence and expansion of urban areas, light industries, manufacturing industries and tourism would lead to increased mineral exploration and eventual exploitation.

Identified negative impacts included: Degradation of natural resource and biodiversity inventories; Significant increase in the production of spoils requiring adequate and non-impacting disposal; Fragmentation of forest resources and land transformation further depleting government reserve forest inventories; pollution of surface waters through increased sedimentation, fuel and hydrocarbon spills, and dumping of toxic materials; Cultural dilution and fragmentation of rural communities.

Energy Sector: Negative impacts expected from this sector were attributed to increasing population and settlement in the area of influence (the economic drawing factor of the projects). Impacts will include but not be limited to: Expanding urban areas; investment in service based industries to support the hydropower sector (Garages and repair facilities; Die-casting and small parts production; cleaning and laundry services; catering services; Financial Services; vehicle sales and rentals; Recreational Services; etc.); increased import and consumption of packaged domestic goods; increasing demand for water; increasing pressure on existing services and utilities; Land take for hydro related settlements, transmission lines and electricity distribution networks; depletion of natural resources; increased incidence of water, air and soil pollution; increased solid waste and waste water generation; cultural dilution and erosion in both urban and rural areas; increased and unstoppable rural to urban migration.

Health Sector and Public Health: Apart from land transformation for the construction and expansion of health facilities throughout the area of influence, Process participants considered that the principal negative impacts that could be expected from the sector were: Increased production of contaminated hospital waste requiring specific disposal methods: Contaminated wastewater and sharps requiring special disposal; Increased incidence of communicable diseases and HIV/AIDS as population density increases in areas serviced by the infrastructure.

Finance Sector: increased access to funds and increasing household incomes could result in depletion of natural resources in line with increasing demand from the population (forest and non-forest products, building materials, land, etc.); increased volumes of waste generated in line with increasing wealth of the population.

Natural Resources: Impact included: Localised depletion as a result if increased demand from the expanding population and settled industries; Deforestation; reduced provision of environmental services; depleted biodiversity inventories.

Detailed descriptions of predicted environmental and socio-economic impacts are presented in Section 6 of the Report. Section-7 of the Report details management and mitigation measures required to offset identified impacts. These measures should be introduced into all future development

plans, structural plans, Five-Year Plans and Annual Plans targeting the Area of Influence or originating from Dzongkhags within the Area of Influence. ***The introduction of identified development actions with embedded management and mitigation measures to any development Plan or Budget ensures that the Plan has been mainstreamed to offset negative impacts, optimise positive impacts and reduce downstream costs for restoration and corrective measures.***

Prioritised development actions have been detailed in section 7.2 of the Report. These have been presented logically and sequentially relative to the prospective development scenarios constructed by process participants. Prioritised actions from Section-7.2 could be used to inform the preparation of the 11th Five-Year Plan. In the short-term, immediate actions could be introduced to Annual Plans and Budgets of the concerned Dzongkhags (assuming the Report is approved, endorsed and translated into Directives to all tiers of Government).

Section-8 of the Report highlights participants choice for the introduction of a new results based instrument to measure progress made towards agreed objectives and targets at the Dzongkhag and Geog level. The Section details a **"Benchmarking"** and Audit process that, in the opinion of Process Participants, could prove effective, increase transparency, operate within and support national principles of GNH, lead to greater coherence and cohesion, identify weakness and reinforce strengths within each Dzongkhag and Geog.

RISK ANALYSIS:

Process participants were requested to consider elements of risk that would or could have a bearing on their proposed scenarios.

For the purpose of the Strategic Assessment, risk was treated as an event that could have a direct or indirect impact on development forecast for any given scenario. In addition, the element of risk was categorised as **likely**, **unlikely** or **uncertain** within the temporal framework of the assessment. The element of risk was also categorised according magnitude of the event and treated as either **critical** or **not critical.**

If an element of identified risk were **both critical and uncertain** then it would preclude any investment or development in areas likely to be affected by the risk element in question.

The Strategic Assessment identified Glacial Lake Outburst Flooding of Basin-2 as a **critically uncertain risk** and therefore demands that risk areas be identified and regulated to exclude all structural or infrastructure development. Risk elements identified by process participants and their categorisation is presented in section 5.6.1 of this Report

AREA OF INFLUENCE: PRIORITISED DEVELOPMENT/PLANNING ACTIONS

Process participants considered the likely development outcomes resulting from their preferred development alternative and structured these in a logical sequence in their prospective scenario presented in Section-5.5 above. The sequence of activities required to plan, execute and monitor each identified development action will be similar in each case and will be preceded by a generic set of actions, which should be carried out between 2010 and 2015.

1. Revision of existing Structural Plans to introduce development priorities identified through this Assessment.

2. Elaboration of a detailed Spatial Development Plan for the Area of Influence and the forecast focal development areas.

3. Identification of GLOF risk areas and systematic development prohibition in all current and future development plans.

4. Promulgation of a Law prohibiting construction and physical development in GLOF risk areas.

5. Preparation of a digital cadastre for the area of influence.

6. Agreement on development macro-zones in the areas of influence where only certain types of compatible development will be permitted.

7. Delineation of identified macro-zones on the digital cadastre.

8. Elaboration of information folders describing the development conditionality that must be met (environmental, physical, structural and social) prior to approval to proceed and licensing.

9. Prepare and make available detailed natural resource and biodiversity inventories for the area of influence and the focal areas.

10. Determine the current state of the environment in the area of influence to include: water quality of surface and ground water; air quality and current emission levels; potential risk areas (landslides, GLOF, flood risk, etc.); current noise pollution levels; present use of fertilizers and pesticides; current volumes of waste and wastewater generated; location and type of waste management in the area of influence.

11. Define limits of change for environmental parameters that cannot be exceeded. The limits shall be structured on international standards

adjusted to the Bhutanese context (example: Euro-4, Euro-5 emission standards for vehicles).

12. Prepare a specific development Plan and Strategy for the establishment of a Special Economic Zone in Lhamoizingka, complete with urban expansion areas and the location of critical infrastructure and services (roads, waste management, sewerage, power transmission and distribution, residential areas, green areas, recreation areas, rail links and terminals to India, hospitals, schools, etc.)

13. Commission a study to analyse (in detail) the option and feasibility of constructing a railway from Sibsoo to Eastern Trashigang. The Railway, as described in this Report would follow an alignment proximal to the border with India and traverse both the Phibsoo and Manas conservation areas.

14. Convene a public hearing to present the findings of the Railway study (11) and agree on the future of the proposal.

15. Identify suitable locations for sanitary landfills and wastewater treatment facilities to service the future Wangdue-Punakha conurbation. Reserve the location and issue directives to assure they are not allocated to other purposes.

16. Revise the existing Roads Development Master Plan in line with the findings and recommendation of this Report. The Plan should be revised to include the construction of a fast trunk road linking Lhamoizingka to Wangdue-Punakha following the shortest and most appropriate alignment adjacent to the future Punasangchu River reservoirs. The Alignment should allow for development of tourism facilities and services (ferry boat, water transport, terminals) on suitable land between the highest high water mark on the shore and the road.

17. Develop a time-based Strategic Plan for infrastructure improvement and upgrading in the area of influence.

18. Commission a detailed study and feasibility study to determine the most appropriate alignment for a road tunnel linking Wangdue-Punakha to Thimphu. The analysis must include a preliminary social and environmental impact profile of the propose works.

19. Identify and reserve an area suitable for construction of a regional airport in Lhamoizingka.

20. Immediately identify alternatives to spoils dumping on riverbanks, valleys or other natural area. Ensure that future hydropower, road, infrastructure, tunnelling, urban expansion activities are not permitted

to dump spoils. The preferred spoils treatment option must be some form of re-use and recycle process with in-built revenue generation opportunities.

21. Initiate marketing and promotion campaigns to attract investment to the focal areas following completion of the Planning processes and the preparation of conditionality information/instruction folders.

22. Agree on Institutional Arrangements for the technical review and approval of license applications for all development types in the area of influence.

23. Agree on the institutional Arrangements for subsequent performance monitoring, state of the environment monitoring and Dzongkhag Performance Audits.

Specific development actions, identified through the above preparatory activities, should be introduced into the 11th Five Year Plan (2014-2019), subsequent Five-Year Development Plans and Annual Plans and budgets derived from these Plans. Introduced actions will be fully mainstreamed thereby reducing their environmental and social impact, enhancing their developmental benefits and reducing downstream corrective and restoration costs.

PROCESS RECOMMENDATIONS:

On conclusion of the Strategic Assessment Process, participants shaped the following recommendations to the Joint Commissions based on their collective experience gained from the Process:

1. Stakeholders recommend that all future development planning or analysis of the development consequences of complex investment projects should be subject to Strategic Assessments to ensure that these deliver optimal development outcomes with minimal environmental, and social impacts.

2. Stakeholders recommend that Strategic Assessment Processes be designed and implemented to ensure that all Dzongkhags are provided with the Technical skills to apply the Process systematically to their development planning and to inform their decision-making processes.

   Opportunities to expose Eastern Dzongkhags to the SA Process could be: Proposed hydropower development on Basin-3 and the development of an International airport and Industrial Estate in the Gelephu region

3. Furthermore, Stakeholders recommend that the 11th Five-Year Plan be elaborated on the basis of systematic Strategic Assessments carried out at Sub-National levels to ensure that each constituent element of that Plan is consistent and coherent to National Development objectives, contributes to local development objectives, is fully mainstreamed to mitigate against predicted point source or cumulative impacts.

4. Stakeholders agree that the principal National Institutional driver for ensuring a systematic application of Strategic Assessments (as a mainstreaming instrument of choice) should be the Gross National Happiness Commission. Stakeholders encourage the Commission to draw on experience gained by participants and, in particular the National Environment Commission Secretariat to facilitate dissemination of the Process to Sub-National Administrations, Line Ministries and other concerned parties.

5. Stakeholders recommend that the Gross National Happiness Commission, together with the National Environment Commission Secretariat issue a directive and prepare an SA Process methodology to enable and monitor the systematic application of the Process, or a variant of it, to all complex development projects.

   Complex development projects shall include but not be limited to: Transport infrastructure; Strategic infrastructure; Hydropower Development; Urban Expansion; Industrial Developments; National Parks and Conservation Areas; Mines and mineral extraction areas and others.

6. Stakeholder participants strongly recommend that the Roads Department consider designing a new Highway to link Lhamoizingka (Kalikhola) to the Sunkosh Bridge junction on the Eastern bank of the Punasangchu River. The Recommendation is based on the outcome of the Process and the need for a fast North-South Trunk Road link to Wangdue-Phodrang, Punakha, Thimphu and the Eastern Dzongkhags.

7. Stakeholders recommend that the Tourism Board of Bhutan initiate a survey and product development initiative to identify and promote tourism opportunities in the vicinity of the Punasangchu River and in particular in areas adjacent to the highway recommended as item-5 above.

   Through the process Stakeholders have identified a significant future tourism resource adjacent to the reservoirs established by the Sunkosh Hydropower Projects, the Phibsoo Wildlife Sanctuary and other natural assets in the region.

8. Stakeholders strongly recommend that all identified GLOF risk areas on the Punasangchu River Basin be categorised as development and

investment exclusion areas. Furthermore, Stakeholders recommend that risk areas be designated as “Green Recreation Areas” and developed for that purpose. Development could include: Park-land; Footpaths; Bicycle paths; Nature Trails; Water recreation areas; Planned picnic sites with fire pits; etc.

1. INTRODUCTION

In line with the objectives of the 10th Five Year Plan (2008-2013), the mandate of the National Environment Commission and the Draft Guidelines for Mainstreaming Environment of Policies, Plans and Programmes, the NECS and its partners (the Gross National Happiness Commission and the National Land Commission have designed and implemented a Participatory Strategic Assessment type process to consider the wider development implications and impacts of series of hydropower developments planned and being constructed on Basin-2, the Punasangchu River a development activity highlighted and prioritised in the 10th FYP.

The National Environment Commission, together with its process partners the Gross National Happiness Commission and the National Land Commission agreed to collaborate to design and implement a rapid, multi-stakeholder and cross-sectoral prospective Strategic Assessment of the prioritised development action. The Assessment used techniques and tools developed for Strategic Environmental Assessment that were adapted and tested to respond to the specific context and need of the Royal Government of Bhutan.

A joint technical committee constituted by members from the Gross National Happiness Commission, the National Land Commission and the National Environment Commission Secretariat was established to guide the Strategic Assessment Process. The technical committee will receive, review and provide comments to this document. Once changes have been introduced the Technical Committee will distribute this document to members of the three Commissions prior to a joint session where process outcomes and recommendations detailed in this report will be discussed.

As a participatory process, the Strategic Assessment brought together representatives from Dzongkhags likely to be directly or indirectly affected by development actions. As such, senior officials from Chukha, Gasa, Punakha, Wangdue-Phodrang, Sarpang, Dagana and Tsirang participated. In addition to these participants, representatives from stakeholder Ministries and administrations were also present. These included: the Gross National Happiness Commission; the NECS; the NLC; the Ministry of Economic Affairs; Ministry of Works and Human Settlement; Department of Roads and the Department of Energy.

The Strategic Assessment of the proposed hydropower projects on the Basin-2 is aligned to Article 5 of the Constitution of the Kingdom of Bhutan (2008), The National Environment Protection Act of Bhutan (2007), the Regulations for the Environmental Clearance of Projects and the Regulations on Strategic Environmental Assessment (2002).

The Strategic Assessment Process is a non-statutory process that leads to the elaboration of technical guidance to better manage and mitigate environmental and socio-economic impacts expected from a preferred and optimal development alternative selected by process participants. As such, proposed management and mitigation can be introduced to any plan or element of a plan and ensures that each action/activity constituting a current or future plan are both coherent and mainstreamed. Process outcomes should serve as a guide and do not replace national and sub-national planning processes. Likewise, results do not replace the need for statutory EIA procedures necessary for environmental clearances and licensing.

The Strategic Assessments were supported through funding provided by joint Royal Government of Bhutan – Government of Denmark *Environment and Urban Sector Programme Support (EUSPS).*

2. BACKGROUND

Process participants selected the Area of Influence for this Strategic Assessment as: Gasa, Punakha, Wangdue-Phodrang, Dagana, Tsirang, Sarpang Dzongkhags (North to South). Participants then considered that development would concentrate in two linked areas Focus Areas: to the North Punakha and Wangdue-Phodrang and the second in the Southern region of Dagana, Sarpang and Tsirang Dzongkhags.

The socio-economic profiles of these Dzongkhags are detailed below:

2.1 ADMINISTRATIVE AND SOCIO-ECONOMIC PROFILE OF THE AREA OF INFLUENCE

GASA DZONGKHAG

Gasa lies in the extreme northwest of the country. It is bordered by Punakha Dzonkghag in the southeast, Thimphu in the southwest, Wangdue in the east and the Tibetan region of China on the extreme north. The Dzongkhag has an area of 4,409.30 square kilometers *(Gasa Dzongkhag, 9th Five Year Plan Document)*, which is 11% of the total area of the whole country. Gasa is the source of the country's two major rivers, the Pho Chhu and the Mo Chhu.

Gasa's altitude ranges from 1,500 meters to 4,500 meters above sea level with a climate that ranges from temperate to alpine characterized by extremely cold winters and short and pleasant summers. The average rainfall in Gasa Dzongkhag is about 2,000mm annually.

The main source of cash income for the people is through the hire of horses and mules to transport goods for tourist on trek and for Bhutanese who visit the Gasa hot springs in the winter. Sale and bartering of livestock products is another source of income for the people of Laya and Lunana Gewogs. A few cereals and vegetables are grown but only in limited areas due to marketing constraints and depredation by wild animals.

The *Layaps* and *Lunaps* lead a pastoral life rearing yaks and sheep in the mountains during summer and move with their herds to permanent settlements in the winter.

Gasa Dzongkhag's cultural heritage includes 13 *lhakhangs* and *chortens*. Gasa is also famous for the *Tshachu* (hot spring), which was destroyed by the floods in 2009. Efforts are currently underway to reconstruct the *Tsachu* which attracts many visitors (both national and from outside) every autumn and winter.

Gasa at a Glance

	Feature	Statistics
1	**Area (Sq.Km)**	4,409.30
2	**Population**	3116
	Male	1635
	Female	1485
3	No. of households	727
4	Population Density (per Sq.Km)	1
5	Number of literate persons	1,278
6	**Trade Licenses**	
	i) Manufacturing	2
	ii) Small and Medium Enterprises	41
7	Subsistence Poverty	1.0
8	**Number of Schools**	
	Community Primary School	2
	Lower Secondary School	1
	Middle Secondary School	1
9	**Land Use**	
	Forest	33.3%
	Pasture	5.3%
	Agriculture	0.2%
	Others (Rocky outcrops, perpetual snow etc)	61.7%
10	**Health Facilities**	
	BHUs	4
	Outreach Clinics with shed	3
	ORCs without shed	5
	Hospital beds	5
11	**Number of Households having access to roads by time taken**	
	Less than 3 hours	196
	More than 3 hours (more than half a day)	531

Source: MOA Statistics and the PHC 2005

PUNAKHA DZONGKHAG

Punakha Dzongkhag is situated in western Bhutan, at the confluence of the Phochhu and Mochhu rivers (that join to form the Punasangchhu). The altitude of the Dzongkhag ranges from 1,200 to 4,800 metres. With a total area of 975 square kilometers, the Dzongkhag is made up of 11 Gewogs. The temperature varies from 30 degrees Celsius during the summer to 5 degrees Celsius during the winter. Punakha receives an average annual rainfall of 1,500mm. Until 1955, Punakha served as the winter capital of Bhutan. The Punakha Dzong continues to be the winter residence of the Central Monk Body.

Punakha Dzongkhag is well known for agricultural products such as rice, vegetables and fruits. Paddy, wheat, maize, and mustard are the main crops grown in the Dzongkhag. Fruits grown in the Dzongkhag include guava, peach, plum, pear and oranges. Chillies, beans, radish, cabbages, brinjal and tomatoes are the common vegetables grown in the Dzongkhag. Vegetables are an important source of income for the farmers of Punakha Dzongkhag.

Being an important landmark in Bhutan's history, Punakha Dzong attracts many tourists every year. The Dzongkhag also boasts of two hot springs, namely the Koma *Tshachu* and the Chhubu *Tshachu,* that attract many Bhutanese every autumn and winter.

Punakha at a Glance

	Feature	Statistics
1	**Area (Sq.Km)**	1,108.3
2	**Population**	23,462
	Male	11,979
	Female	11,483
3	Number of households	4,564
4	Population Density (per Sq.Km)	21
5	Number of literate persons	12,860
6	**Trade Licenses (2007)**	
	i) Manufacturing	3
	ii) Number of service automobile workshops	1
	iii) SMEs	154
7	Subsistence Poverty Incidence	1.9
8	**Number of Schools**	
	Community Primary School	8
	Lower Secondary School	3
	Middle Secondary School	1
	Primary School	2
	Higher Secondary School	1
	Private Higher Secondary School	1
9	**Land Use**	
	Forest	89.4
	Pasture	1.9
	Agriculture	4.7
	Others (Rocky outcrops, perpetual snow etc)	3.9
	Settlements	0.1
	Orchards	28ha
10	**Health Facilities**	
	Hospitals	1
	BHUs	5
	ORCs with shed	8
	ORCs without shed	1
	Hospital beds	40
11	**Number of Households having access to roads**	

	by time taken	
	Less than 3 hours	4,399
	More than 3 hours (more than half a day)	165

WANGDUE DZONGKHAG

Wangdue Dzongkhag is located in Western Bhutan and is bordered by Punakha in the north, Thimphu in the west, Trongsa in the east and Tsirang in the south.

Wangdue-Phodrang has an area of about 4,308 square kilometres with elevations ranging from 800 to 5800 meters above sea level. The summers are moderately hot and the winters cool with the northern part of the Dzongkhag remaining under snow cover. The Dzongkhag receives about 1000mm of rainfall annually.

Wangdue is the second largest district in Bhutan, comprising of fifteen vast and diverse Geogs. Of the fifteen Geogs, Phobjikha Geog is famous as the winter habitat of the Black-necked Cranes. The Jigme Dorji Wangchuck National Park extends into the northern part of the Dzongkhag and covers almost four Geogs. Gangtey Goenpa and Boed Langdra are other important cultural sites in the Dzongkhag.

Rich pasture for livestock is located in the higher Geogs of Phobjikha, Gangtey, Sephu and Dangchu. There are about 39,380 heads of livestock in the Dzongkhag that provide income to rural households through the sale of butter and cheese (Wangdue Dzongkhag, 9th Five Year Plan Document).

Paddy is an important crop and paddy fields are mostly located along the Dangchu and Puna Tsang Chu where two crops of rice are grown annually. Potato is an important cash crop for the Geogs of Phobji, Gangtey and Sephu while citrus production is increasing every year in the Geogs of Daga, Bjena, Phangyul and Rubeisa. Ginger is an important cash crop in Daga and Athang Geogs. The lower valley towards the southern belt is best suited for sub-tropical horticulture crops such as oranges, mangoes, pineapples, guavas etc.

Wangdi at a Glance

	Feature	Statistics
1	**Area (Sq.Km)**	4,029
2	**Population**	31,135
	Male	16,083
	Female	15,052
3	Number of households	6227
4	Population Density (per Sq.Km)	8
5	Number of literate Persons	14,894
6	**Trade Licenses (2007)**	
	i) Manufacturing	25
	ii) SMEs	426

	iii) No. of service automobile workshops	5
7	Subsistence Poverty (2007)	1.9
8	**Number of Schools (2007)**	
	Community Primary School	13
	Primary School	5
	Lower Secondary School	3
	Middle Secondary School	2
	Higher Secondary School	1
9	**Land Use**	
	Forest	73.8
	Pasture	3.5
	Agriculture	2.3
	Orchards	5ha
	Settlements	0.1
	Others (Rocky outcrops, perpetual snow etc)	20.3
10	**Health Facilities**	
	Hospital	1
	BHUs	4
	ORCs with shed	11
	ORCs without shed	2
	Hospital beds	20
11	**Number of Households having access to roads by time taken**	
	Less than 3 hours	5380
	More than 3 hours (more than half a day)	847

TSIRANG DZONGKHAG

Tsirang Dzongkhag is located in the south-central part of the country. The Dzongkhag's altitude ranges from 400 to 2000 meters above sea level. Approximately 58% of the land is under forest cover comprising mainly of broadleaf and chir pine species.

Damphu, in Kikhorthang Gewog, is the main town and the administration centre.

The Dzongkhag has good development potential. The diverse agro-ecological features provide the Dzongkhag with potential for the cultivation of many different types of cereals as well as horticulture crops. Paddy, maize and millet are the major cereal crops grown while orange, cardamom and vegetables are the principal cash crops. Mandarin constitutes an important source of cash income for most of the farmers. Livestock rearing is also an important economic activity contributing to both subsistence consumption and income generation.

With the Wangdue-Sarpang highway passing through the Dzongkhag and a good network of internal roads and mule tracks, most of the Geogs in the

Dzongkhag are well connected. The Dzongkhag benefits from market access to major towns like Gelephu and Thimphu. The shortage of power supply is, however, a major constraint faced by the Dzongkhag.

Tsirang at a Glance

	Feature	Statistics
1	**Area (Sq.Km)**	1807.3
2	**Population**	13,419
	Male	9517
	Female	9150
3	Number of households	3651
4	Population Density (per Sq.Km)	7
5	Number of literate Persons	8,931
6	Trade Licenses (2007)	
	i) Manufacturing	7
	ii) SMEs	186
	iii) Number of service automobile workshops	4
7	Subsistence Poverty (2007)	2.5
8	**Number of Schools**	
	Community Primary School	5
	Primary School	2
	Lower Secondary School	2
	Middle Secondary School	1
	Higher Secondary School	1
9	**Land Use**	
	Forest	76.2
	Pasture	86ha
	Agriculture	21.7
	Orchards	0.1
	Settlements	4ha
	Others (Rocky outcrops, perpetual snow etc)	1.8
10	**Health Facilities**	
	Hospitals	1
	BHUs	4
	ORCs with shed	11
	ORCs without shed	2
	Hospital beds	20
11	**Number of Households having access to roads by time taken**	
	Less than 3 hours	3086
	More than 3 hours (more than half a day)	565

DAGANA DZONGKHAG

Dagana Dzongkhag is one of the remotest Dzongkhags in the country with dispersed and remote settlements. The Dzongkhag consists of eleven Geogs. It shares its borders with Thimphu and Chukha Dzongkhag to the west, Wangdue-Phodrang Dzongkhag to the north, Tsirang Dzongkhag to the east and Sarpang Dzongkhag to the south. The elevation ranges from 600m to over 3800m above sea level. The Dzongkhag falls within the Temperate Zone in the north and sub-tropical zone in the south and is characterized by hot and wet summers and cool and dry winters.

About 79% of the total area of the Dzongkhag is under forest cover with tree species like *Champ, Arguray*, Chir pine and Sal, etc. The Dzongkhag has 4,782 hectares of *Kamzhing* (dry land) and 2,115 hectares of *Chuzhing* (irrigated/ Wetland). There are about 6,050 hectares of land under mixed cultivation.
With improved breeds of livestock and support in the form of good feed and fodder, the Dzongkhag has good potential for livestock development

The Dzongkhag produces considerable quantities of oranges and cardamoms. The Dzongkhag has good potential for growing cash crops like ginger, mango, green gram and mustard to increase the cash income of the people.

The rugged terrain with poor road conditions hampers communication both within and outside the Dzongkhag. The high cost of living due to shortage of supplies and high cost of transportation to and from the Dzongkhag are other problems faced by the inhabitants of the Dzongkhag. The construction of the Dagachu Hydropower Project is expected to bring immense economic opportunities for the people of Dagana and ease some of these constraints.

Dagana at a Glance

	Feature	Statistics
1	**Area (Sq.Km)**	1,724.3
2	**Population**	22,670
	Male	11,500
	Female	11,170
3	Number of households	4,350
4	Population Density (per Sq.Km)	13
5	Number of literate Persons	9,896
6	**Trade Licenses (2007)**	
	i) Manufacturing	
	ii) SMEs	208
	iii) Number of service automobile workshops	3
7	Subsistence Poverty	9.7
8	**Number of Schools**	
	Community Primary School	14
	Primary School	2
	Lower Secondary School	2
	Middle Secondary School	2
9	**Land Use**	
	Forest	82.2
	Pasture	1.2
	Agriculture	12.7
	Orchards	1.1
	Settlements	4ha
	Others (Rocky outcrops, perpetual snow etc)	2.9
10	**Health Facilities**	
	Hospitals	
	BHUs	8
	ORCs with shed	13
	ORCs without shed	5
	Hospital beds	5
11	**Number of Households having access to roads by time taken**	
	Less than 3 hours	3454
	More than 3 hours (more than half a day)	896

SARPANG DZONGKHAG

Sarpang Dzongkhag is situated in the central southern foothills bordering India. The Dzongkhag stretches from Lhamozingkha in the west to Manas National Park in the east. Its topographic features have undulated terrain with elevations ranging from 200m to 3600m above mean sea level. About 12% of the total area is under agriculture. Paddy, maize, wheat and millet are

some of the major crops. Cash crops such as orange, areca nut, cardamom, ginger, guava, lemon, banana and mango are grown extensively.

Sarpang is one of the oldest towns in the country with access to motorable roads as early as in the 1950s. Due to its close proximity to the Indian markets, Sarpang has been the commercial centre for the central Dzongkhags. Favourable terrain and climatic conditions combined with fertile agricultural land offer tremendous opportunity for farm mechanization and commercial horticultural development in the Dzongkhag.

Sarpang at a Glance

	Feature	Statistics
1	**Area (Sq.Km)**	1304
2	**Population**	60,100
	Male	19,332
	Female	17,769
3	Number of households	7,346
4	Population Density (per Sq.Km)	46
5	Number of literate Persons	19,075
6	**Trade Licenses**	
	i) Manufacturing	41
	ii) SMEs	766
	iii) Service Automobile workshops	16
7	Subsistence Poverty (2007)	3.3
8	**Number of Schools**	
	Community Primary School	8
	Primary School	1
	Private Primary School	2
	Lower Secondary School	5
	Middle Secondary School	1
	Higher Secondary School	1
9	**Land Use**	
	Forest	83.3
	Pasture	0.6
	Agriculture	12.0
	Orchards	0.3
	Settlements	0.1
	Others (Rocky outcrops, perpetual snow etc)	3.8
10	**Health Facilities**	
	Hospital	2
	BHUs	10
	ORCs with shed	13
	ORCs without shed	4
	Hospital beds	75
11	**Number of Households having access to roads by time taken**	
	Less than 3 hours	6643

More than 3 hours (more than half a day) 703

2.2 ENVIRONMENTAL PROFILE OF THE AREA OF INFLUENCE

Bhutan is situated in the Eastern Himalayas and its fragile mountainous ecosystem makes it vulnerable to changes in the state of its natural environment. The conservation of the natural environment is highlighted as one of the four pillars for "Gross National Happiness," Bhutan's development philosophy that has gained much international acclaim in recent years. In spite of the increasing pressure from socio-economic development and modernization, the conservation of its natural resources continues to be a priority for the Royal Government.

The area of influence is also the home of two Protected Areas and one Conservation Area. Sprawling across 4,349 sq km, Jigme Dorji National Park is home to a diverse species of flora and fauna. This national park covers the entire Dzongkhag of Gasa and the western areas of Thimphu and Paro districts. Jigme Dorji National Park has more than 30 species of mammals, 300 species of birds, and 1400 species of plants. Snow leopards, Black bears, markot, sambar, barking deer, Takin and musk deer are found in this area. Semi-nomadic people living here are mostly yak herders who harvest medicinal and aromatic plants and subsist on marginal agriculture and forest products. The park is also the source of some of Bhutan's main rivers.

Phibsoo Wildlife Sanctuary has an area of 278 Sq. Km. and is located in south-central Bhutan in Sarpang Dzongkhag. It is the only protected areas in the country where natural Sal forest and chital deer are found. Like Royal Manas, Phibsoo is home to Elephants the Royal Bengal Tiger, Gaur, three species of Mahseer and possibly the rare Ganges River dolphin. Unlike Royal Manas, it has no human residents. Phobjikha valley, in Wangdue Dzongkhag, is situated at 3000m on the periphery of the northwestern tip of Jigme Singye Wangchuck National Park. The valley has been declared a Conservation Area as it is one of the main winter habitats of the Black-necked Cranes. These birds are internationally endangered and only a few thousand remain in the wild, all of which are in the Himalayan region. The Cranes spend their summers in Tibet where they breed and rear their young before setting out every year to spend their winters in Bhutan.

Large-scale developmental activities will definitely have adverse environmental impacts on the area of influence. The Punatsangchu Basin is the nesting place of the White-bellied Heron, a globally threatened bird species. About 23 birds nest in the basin of the Punatsangchu River. With the commencement of the Punatsanchu 1 Project, the habitat of these rare birds is threatened. Similarly the river basin is also the spawning ground for migrating fish species such as the Mahseer. The construction of a series of dams on the Punatsanchu River will have a direct impact on their migration route and spawning grounds.

The area of influence continues to enjoy good air quality. The main sources of air pollution in the area are from the combustion of biomass for supply of domestic energy and agricultural activities, combustion of fossil fuels from vehicular emissions, and fugitive dusts from unpaved roads and new construction sites. Most of the satellite towns in Bhutan do not have proper waste disposal systems so the waste is burnt thereby polluting the urban air. However, the number of vehicles in the area of influence continues to grow every year and although vehicle emissions testing is conducted every year, this needs to be supported by more effective monitoring programs to ensure that vehicles that fail the standards rectify their emissions.

There are no major industries located in the area of influence so air pollution as a result of industrial emissions is not an issue.

Based on the preliminary data collected by the NEC, it can be said that the quality of water in the area of influence is healthy. The data indicate that the main rivers and their major tributaries, with some exceptions, are still of a pristine quality. The natural water quality of the rivers can be characterized as highly oxygenated, slightly alkaline with low conductivity and no recorded salinities. However, there are localized pollution problems that need attention to avoid health problems and deteriorating recipient conditions. Chief among these are the unsanitary conditions found along the banks of streams and rivers both in urban areas and in rural locations. This problem is exacerbated at urban locations where surface drainage, oil and grease spills from workshops, grey water sullage from domestic households and uncontrolled seepage/overflow from septic tanks and piping flow directly into the rivers. The

As in other parts of the country, the area is also experiencing land use changes. The rising population has aggravated the situation and will further worsen it if timely counter measures are not taken. Hydropower production is the biggest source of revenue for the country. In addition, hydropower is viewed as an essentially clean source of energy and a means of reducing the country's dependence on traditional solid fuels, e.g. fuelwood and fossil fuel, which are much more environmentally damaging and expensive. The socio-economic and environmental benefits notwithstanding, hydropower development can impose some environmental and social costs. Construction of dams, power transmission and distribution lines, and associated infrastructure such as access roads has a bearing on land stability and biodiversity. Influx of non-native construction workers in massive numbers exposes the local population to acculturation and exerts additional population pressure on the surrounding natural resources *(Bhutan Environment Outlook 2006).* The construction of major hydropower projects and associated activities such as road construction, operation of quarries and the construction of transmission lines in the area will further exacerbate the problem if not monitored properly.

Solid waste generation and disposal have emerged as a major environmental problem particularly in the urban areas in recent times. Rapid urbanization, growing affluence, changing consumption patterns, low level of awareness and poor civic sense among the Bhutanese public are the key factors causing increased waste generation. The solid waste problem is growing exponentially in urban towns in the area of influence. Apart from municipal solid waste, there is also the concern of health care waste and industrial solid waste. Data on industrial solid waste is currently not available. As for health care waste, the Health Care Waste Management Plan produced by the Ministry of Health in 2004 provides an estimated figure of 73.2 tons of infectious waste per year. Electronic waste, in this day and age of television, computers, cell phones and various other electronic gadgets is also a major emerging concern *(Bhutan Environment Outlook 2008).*

3. METHODOLOGY

The Strategic Assessment was tailored to the specific needs of the Royal government of Bhutan represented by: The National Environment Commission and Secretariat; the Gross National Happiness Commission; the National Land Commission; Stakeholder Dzongkhags and key Line Ministries.
The methods used were a composite of: The OECD/DAC methodology as described in their *Good Practice Guidance* (2006); the United Nations University Course Modules on SEA of 2006; GTZ-SEA guidance; Danida guidance on SEA applications; the Experience of the Scottish Executive detailed in their SEA Toolkit (2006); the guidance provided by the International Association of Impact Assessment (IAIA) and personal SA application experience of the Process Facilitator (Michael P. Pearson PhD. Danida Technical Advisor to NECS)

3.1 WHAT IS A STRATEGIC ENVIRONMENTAL/STRATEGIC ASSESSMENT

Sadler and Verheem (1996) drafted the generally quoted definition for Strategic Environmental Assessment (SEA):

"SEA is a systematic process for evaluating the environmental consequences of proposed policy, plan or programme initiatives in order to ensure they are fully included and appropriately addressed at the earliest appropriate stage of decision-making on par with economic and social considerations". The Process includes a written report and the involvement of both stakeholders and the public throughout the process.

The OECD-DAC, SEA Task Team (2006) defined the process as:

"*A range of analytical and participatory approaches that aim to integrate environmental considerations into Policies, Plans and Programmes and evaluates their inter-linkages with economic and social considerations"*

The SEA/SA process by definition must therefore be an issues driven participative approach to the environmental assessment of plans, policies, programmes development proposals or complex projects. Furthermore, it should contribute to sustainable development through the assessment of strengths, weaknesses, and environmental resources, which can support or be detrimental to development.

The process is designed to:

- Be implemented pro-actively and should inform and be supportive of development proposals.

- Facilitate the design of environmentally sustainable policies, plans, development proposals and complex projects.

- Consider a range of alternative options to the proposed policy, plan, programme, development proposal or complex project

- Consider the cumulative effects of the proposed policy, plan, programme or development proposal on a local, sectoral, regional, national or global perspective.

- Define the environmental parameters within which a particular development proposal can be realised.

- Create a framework against which impacts and benefits due to a particular policy, plan, programme or development proposal can be measured.

- In the present (Bhutan) context, the process is designed to be fully transparent, participatory and deliver cross-sectoral co-ordination essential to consistent decisions and rapid implementation of development proposals.

3.2 STRATEGIC ENVIRONMENTAL ASSESSMENT – A PROCESS TAILORED TO THE BHUTANESE CONTEXT

The present SA process responds to the mainstreaming requirements of the 10th Five Year Plan, which called on all Sectors, Agencies, Dzongkhags and Gewogs to mainstream environmental issues into their Policies, Plans, Programmes and Projects.

In 2002, the National Environment Commission enacted its Regulations on Strategic Environmental Assessment of Policies, Plans and Programmes as per the articles and provisions of the Environmental Assessment Act of 2000. These Regulations were not put into practice given that Line Ministries considered that the enacted Regulations would lead to delays in Government processes and therefore impede development. Since then, the Regulations have been kept on standby but agreement was reached that they would be activated and applied, as necessary, to proposed "*mega-projects"* of national significance.

At present, mainstreaming has taken on a new dimension and impetus in Bhutan. Inclusion of mainstreaming requirements to the 10th Plan has led the NEC and GNHC to prepare draft Environment Mainstreaming Guidelines. These have been circulated and will now be incorporated into a generic guideline focused on GNH and incorporating Environment, Poverty and Climate mainstreaming guidance for Policies, Plans, Programmes and

Projects. This set is being prepared by the GNHC with support from NEC under the auspices of Danida and UNEP/UNDP.

The present effort is piloting a new and simplified approach to mainstreaming. It is a bottom-up approach that: Forecasts planned and expected development; Prioritises sequential and coherent development actions; Informs development planning and introduces management and mitigation measures to offset all predicted impacts *pro-actively.*

This approach is appropriate to the current development context and will serve to reinforce National mainstreaming initiatives and directives. The approach ensures that all elements constituting a Plan or Programme have been mainstreamed prior to introduction to the instrument. As such, given that all constituent elements of the Plan or Programme have embedded impact management and mitigation, then, the Instrument is by definition mainstreamed.

3.3 SA PROCESS ORGANIZATION

The Strategic Assessment of the Development impacts expected from hydropower developments on Basin-2 (the Punasangchu River) was initiated by the National Environment Commission Secretariat and led jointly by the NEC, the GNHC and the NLC on behalf of the GNHC. The Assessment has been implemented. The SEA was organized as follows:

The Joint Commissions lead the process and comments on the results of the Technical Group responsible for contributing towards the successful conclusion of the different stages of the Process. The Joint Commissions receive the SA Report, provide comments and finally recommend endorsement of the Document.

The Endorsed Report is then delivered to concerned Dzongkhags with instructions to introduce mainstreamed outcomes to their future development plans.

A Technical Group comprising representatives of all stakeholder groups (Central Government, Concerned Dzongkhags, Geogs, Experts, the General Public, NGO's, Associations, etc) was called to participate in the process. The Technical Group was provided with training and support to enable them to contribute effectively to the process.

The Technical Group was asked to participate in two consultative workshops during which objectives were agreed, alternatives identified and selected, impact assessment was carried out and management/mitigation measures identified and outcome recommendations drafted. As such, the Technical Group was critical and key to the successful outcome of the Process.

3.4 GEOGRAPHIC SCOPE OF THE STRATEGIC ASSESSMENT

Workshop participants considered the geographic focus of the Assessments and through consultation have agreed on the following:

For the Assessment considering development on Basin-2 the geographic focus will be Gasa, Punakha, Wangdue-Phodrang, Dagana, Sarpang, Tsirang and Chukha Dzongkhags. Participants also agreed that the principal focus areas should be Wangdue-Phodrang and Punakha and the belt including southern Dagana, Sarpang and Tsirang. Dzongkhags on the East-West Highway will also be considered as required during Workshop-2 discussions. (See Figure-1 pg. 6)

3.5 TEMPORAL FRAMEWORK OF THE STRATEGIC ASSESSMENT

Workshop participants considered the temporal framework of the Assessments and through consultation have agreed, both for the Basin-2 assessment and the Dhamdum industrial estate assessment, that the assessment period shall be 20 years (*present to 2029*).

Agreement was reached that the assessment will be considered in 5-year increments in order to better inform future 5-year planning cycles.

3.6 PROCESS METHODOLOGY

The methodology applied in this Strategic Assessment Process was structured on and is similar to the standard approach described in Section-3 and Annex- 1 (12.1) of this Report. Certain steps were adjusted as follows:

1. **Screening:** Gross National Happiness Commission, the National Environment Commission and the National Land Commission agreed that hydropower investments initiated and proposed for Basin-2 the Punasangchu River were likely to have both significant and wide ranging development consequences and significant point-source and cumulative environmental, social, economic and GNH impacts.

   In order to better understand the nature of expected development and effectively manage identified impacts it was agreed that the most appropriate tool would be a Strategic Assessment.

   The National Environment Commission was instructed to lead the Strategic Assessment Process on behalf of the Gross National Happiness Commission and to include the National Land Commission as its Process Partner.

2. **Scoping:** This stage of the Assessment process was carried out through site visits to concerned Dzongkhags, discussions with Dzongdags, Dzongkhag Environmental Officers, and officers from concerned central administrations. In addition existing information sources were identified from the Ministry of Agriculture, The Ministry of Works and Human Settlement, GNHC, the NECS, the NLC, Ministry of Economic Affairs and others.

   Process design was also detailed during the Scoping stage and later validated by Process participants during the first Workshop.

3. **Identification of Alternatives:** Alternatives to be considered and analysed during the Process were identified and selected by Process participants/stakeholders. All alternatives proposed by the floor during plenary sessions were initially retained. Participants reduced the number of proposed alternatives through discussion and vote. Only those Alternatives retained were analysed through scenario construction, risk analysis and expert judgement.

4. **Selection of the Preferred Alternative:** On completion of the prospective analysis through scenario construction and expert judgement, participants presented their analysis to the floor in a plenary session. A plenary discussion and debate on the outcomes of each analysis led to the selection of a preferred alternative(s).

5. **Impact Identification and Assessment:** The technical group /process participants were then requested to detail each development action likely to comprise the preferred alternative over the temporal and geographic scope of the Assessment.

   Environmental, social, economic and GNH impacts (point source and cumulative) expected from each development action were then identified together with requisite management and mitigation necessary to offset the predicted effect.

   Projected development was then plotted as polygons on maps and Google-Earth images. Though this is a low resolution mapping exercise, it was sufficient to address issues of compatibility and spatial relationships both in the focal area and the identified area of influence.

   Development polygons were then conditioned through the introduction of prescribed conditions that should be met prior to issuance of licences and environmental clearance. This process outcome serves to inform prospective investors and reduce the need

for subsequent impact assessment. The outcome also streamlines future monitoring needs.

6. **The SA Report:** The *Draft* Strategic Assessment Report was prepared and distributed to participants for comment. Participants were requested to verify that the Draft Report accurately reflected their consensual views and did not introduce issues and elements that were not discussed by them during the proceedings.
   Comments received from stakeholders and participants were then introduced to the Report as appropriate. Comments not edited into the Report are normally presented as an Annex to the Report with reasons why the comment was not introduced to the Report.

   The Finalised *Draft* Report is then distributed to members of the Commissions (GNHC, NECS and NLC) prior to convening a joint Commission meeting. Any comments received from the Commissions, or instructions from the Commissions are then introduced to prepare the Final Strategic Assessment Report.

   Stakeholders are represented at the Joint Commission meeting to ensure that proposed changes and instructions from the Commissions do not alter the sense or context of the Report.

   On completion of this stage of the Assessment, the Report is ready for validation and endorsement by the Chairman of the Joint Commissions.

   The Chairman of the joint Commission may wish/instruct that the Final Report be submitted for endorsement to a higher national authority (the Prime Minister or the Cabinet).

7. **Validation of the Results:** Completion and acceptance of the Final Strategic Assessment Report by the Commissions is considered a validation of its results, outcomes and recommendations. Validation is underlined by the signature of the Report Cover Note by the Chairman of the Commission and the designated senior representative of all process partners (GNHC, NECS, NLC).

8. **Statement of Endorsement:** Once the Report has been adjusted and validated by the joint Commissions, a Statement of Endorsement is prepared and submitted by the joint Commissions to their Chairman.

   The Statement of Endorsement is an official document that serves to instruct central and lower tiers of government to introduce mainstreamed Process results and outcomes to their future plans. It also instructs government to act on Process recommendations.

3.7 PUBLIC CONSULTATION

Public Consultation is an essential step in any Strategic Assessment Process. In this case public consultation was carried out in two ways:

1. Dzongkhag Environment Officers personally introduced the Report to communities at the Geog level in the focus area and the area of influence. They explained the process and described its outcomes and recommendations. Comments received from communities were recorded and transmitted to the NECS for inclusion (as necessary) to the Report. Comments received from communities are included as annexes to this report.

2. The Draft Report is to be presented to the public and concerned authorities at a National Consultation Workshop to be held in Thimphu (over a 1-day period) during the month of March 2010. Comments received during this workshop will also be included (as needed) into the Report. Comments Received will also be introduced to the Comments Annex mentioned in item 1 above.

3.8 STRATEGIC ASSESSMENT: WORKSHOP-1

A First consultation workshop to introduce the Strategic Assessment Process to stakeholder participants was held in Wangdue-Phodrang from the 31st of August to the 4th of September 2009.

54 stakeholder participants from Gasa, Punakha, Wangdue-Phodrang, Dagana, Tsirang, Sarpang and Chukha Dzongkhags, the NECS, GNHC, NLC, Department of Energy, Ministry of Agriculture and the Ministry of Economic Affairs attended this workshop (The participants' list is presented as Annex-12.1 of this Report)

During the First Workshop, participants were introduced to: Strategic Assessments; presented with international case studies of similar assessments; introduced to assessment tools including: prospective processes through scenario construction; value of expert judgement; using risk and probability; construction of a zero (business as usual scenario); setting the geographic and temporal scope of the assessment; collaborative discussion techniques; setting the objective of the assessment; identification of global issues, topics and themes to be considered during the assessment and setting sub-objectives relative to selected topics and themes. Participants also elaborated a range of alternative development options to be developed (through scenario construction) during the second workshop.

3.9 DEFINING A BASELINE: DATA AND INFORMATION GATHERING AND COMPILATION

In order to fully understand changes expected from development of mega-hydropower projects on Basin-2, it is necessary to clearly define the current status of environmental and social systems in the area of influence likely to be affected (positively or negatively) by the development actions.

In the current case, participants have considered the current state of the environment, existing environmental management systems and processes in place. The baseline considers: Existing Structural Development Plans; Solid waste management systems; waste water treatment facilities; management and mitigation of glacial outburst floods; current land use; urban footprints and expected urban expansion areas; forest cover and forest management systems; existence and extent of critical ecosystems; conservation and biodiversity management units and processes; demographic and social development trends in the area of influence.

Results have shown that the current state of the environment in the area of influence under consideration is near optimal and the direct result of national environmental management priorities prescribed in the Constitution and detailed in National Legislation and their accompanying directives and regulations.

Baseline information has been collated from Bhutan's Environment Outlook Report of 2008, Environmental Impact Assessments of the Punasangchu-1 Hydropower development, studies related to the Dagachu Hydropower and reservoir project, GLOF Risk assessments, site visits and expert knowledge.

Current baseline information is systematically improved as new data and information becomes available and is introduced to subsequent SA cycles.

3.10 STRATEGIC ASSESSMENT: WORKSHOP-2

A Second consultation workshop to Complete the Strategic Assessment Process initiated during the first workshop was held in Paro from the 23rd to the 28th of November 2009.

45 stakeholder participants from Gasa, Punakha, Wangdue-Phodrang, Dagana, Tsirang, Sarpang and Chukha, Dzongkhags, the NECS, GNHC, NLC, Department of Industry, Department of Roads, Ministry of Agriculture and the Ministry of Economic Affairs attended this workshop (The participants' list is presented as Annex-12.1 of this Report).

During the Second Workshop participants were asked to re-visit the results of the first workshop and consider whether selected objectives, sub-objectives, topics and themes were still valid. Changes or additions were considered by participants and original choices adjusted as necessary.

During the second workshop, participants continued their work initiated during the first workshop. With experience gained from construction of the zero (business as usual) scenario, participants constructed prospective development scenarios complete with expected social, environmental and economic impacts for each selected alternative development option.

On completion of the prospective scenario building activity, participants presented results and then selected a preferred alternative through a transparent voting process.

The preferred alternative was then detailed over the temporal and spatial scope of the assessment.

Impacts expected from each identified development action constituting the development alternative over the temporal and spatial scope were identified and mitigation/management measures were proposed.

Identified development actions were plotted on either a 1:50,000 map or on to Google-Earth images to understand spatial relationships and identify areas where incompatibilities could result loss of investment value, cumulative impacts or other outcome. Discussion and negotiation among participants either led to e repositioning of the development activity or adjustment to proposed management and mitigation measures.

The workshop was concluded with a discussion on implementation and monitoring options. A benchmarked and results based monitoring system was introduced and accepted by participants as the most suitable to their development purposes. The benchmarking system proposed is closely linked to national development and GNH indicator sets.

Finally, Participants agreed on a set of recommendations to be included in the Strategic Assessment Report (see Section-9 of this Report).

3.11 ASSESSMENT METHODOLOGY

For this particular prospective Strategic Assessment, methodology used was structured on:

1. Scenario construction for each development alternative identified by process participants;

2. Forecasting techniques based on expert judgement, risk and probability assessments/analysis, proximity analysis and vulnerability mapping.

Process participants were provided with support and instruction on the use of the various techniques (item-2 above) and effectively applied these as they constructed their scenarios. The methodology selected and used permitted direct comparison and evaluation of each scenario relative to others developed and permitted participants to select a preferred (optimal) development alternative.

The preferred alternative was also compared to the "business as usual" (Zero option) scenario to determine the likely and expected/predicted impacts of the selected alternative over the temporal scope of the assessment.

The selected methodology was suitable to a "first generation" Strategic Assessment and particularly well suited to the "bottom-up" approach adopted for this Assessment. The principal intent of the Assessment was to inform development planning and choice making through a clear identification of individual planning elements that would constitute any future plan. The process was also designed to ensure that each identified planning element or action was mainstreamed to include management and mitigation measures to offset identified impacts (point source and cumulative).

3.12 DESCRIPTION OF THE (ZERO OPTION): BUSINESS AND USUAL SCENARIO

The Zero (or business as usual) scenarios consider a development picture of the area of influence and selected focus areas in a situation where there is no foreseen development of hydropower on the Punasangchu River Basin. Though this situation is some distance from the reality (the Punasangchu-1 hydropower development has been initiated), it is important to project how development would evolve over the 20-year time frame without the catalytic effect of the hydropower projects on their area of influence.

The participants' consolidated "zero" scenario is presented as Annex-12.2 of this Report.

3.13 IDENTIFICATION AND SELECTION OF ALTERNATIVES

Section-5 of this Report details alternative development options proposed by Process participants and analysed through prospective scenario construction and expert judgement. Development expected in each of the proposed alternatives was considered relative to the zero (business as usual) scenarios described in section 5.12 above and Annex-4 of this Report.

4. OBJECTIVE AND SUB-OBJECTIVE OF THE STRATEGIC ASSESSMENT

4.1 PURPOSE OF THE OBJECTIVES AND SUB-OBJECTIVES

The Objective and Sub-Objectives of the Strategic Assessment serve to guide and focus the Process. Sub-Objectives ensure that discussions do not drift to out of control. The Objective ensures that all choices and outcomes are coherent and aligned to both Process and National Objectives.

4.2 THE OBJECTIVE OF THE SA

The objective of the strategic assessment should be aligned to national visions, goals and development objectives. In principle, the objective of the Strategic Assessment can be drawn from the 10th Five-Year Plan and adjusted to the specific context of the Strategic Assessment.

As such, it was recommended that participants draft their proposed Strategic Assessment objective based on the core development planning principles of the Kingdom of Bhutan:

" The core principles of Bhutan's development planning have essentially focused on fulfilling the fundamental objectives of achieving broad based and sustainable growth, improving the quality of life, ensuring the conservation of the natural environment, preserving the country's rich culture and strengthening good governance

Process stakeholders agreed that the SA Process objective would be:

"To analyse through relevant stakeholder and public participation, a number of alternative development scenarios expected from investments in Projects on Basin II to enable the selection of optimal solutions delivering maximum sustainable (GNH) benefits of Bhutan while minimizing the cumulative impacts of that development".

4.3 IDENTIFICATION OF TOPICS AND THEMES TO BE CONSIDERED

The principal global themes (identified by process participants) to be considered during the assessment were climate change, poverty, and water resources to include basin management and trans-boundary issues. Of these, climate change typified by: Fluctuating rainfall patterns; flooding events; accelerated glacial melt and glacial outburst floods (GLOF) were all retained

by workshop participants. As such, these were considered critical to any consideration of future development in the geographic and focus areas.

Salient issues, identified by process participants, to be considered throughout the assessment included but were not limited to:

- Protection and conservation of critical and sensitive areas;
- Land Tenure and land-use (current and forecast)
- Hydrology and drainage patterns;
- Protection of cultural/religious assets and heritage sites;
- Cultural dilution;
- Settlements and settlement patterns;
- Land-take of the various development and infrastructure options under consideration;
- Habitat and resource fragmentation;
- Current and future demand on natural assets (forests, wildlife, minerals, water, land, etc.) both legal and illegal.
- Expansion of existing urban areas;
- Poverty and migration (at local, national and regional levels);
- Trans-boundary issues (trade, tourism, conservation, transport, critical resources including water resource management, etc.)
- Contamination of common resources (waste discharges, waste management, specific location of primary and secondary industrial areas, etc.);

4.4 THE SUB-OBJECTIVES OF THE STRATEGIC ASSESSMENT

The Sub-Objectives drafted by process participants and presented below are the product of consensus and, as noted above, serve to frame and focus discussion and prospective analysis of the various alternatives assessed.

A Sub-Objective is drafted and agreed for each of the topics and themes identified by process participants as critical to the strategic assessment.

TOPIC/THEME	SUB-OBJECTIVE
Climate Change	Development planning and associated investments in the area of influence of Basin-2 hydropower investments are directed and planned taking into consideration risks and cumulative impacts expected from climate change and systematically introducing

	mitigation and management measures.
Watershed and Catchment Basins	Catchment basins and water supplies are mapped, inventoried and effectively managed to ensure continued delivery of critical ecosystem services to downstream users and the State.
Economic Development	Economic and urban development of Dzongkhags and Geogs directly affected by investment in Basin-2 hydropower developments is planned, coherent, sustainable and, as such, does not impact negatively on the population, the environment and conserves inter-generational equity.
Tourism , Eco-tourism and Tourism Services	Development of tourism assets and opportunities in the area of influence of Basin-2 hydropower developments are identified, zoned, promoted, developed sustainably and contribute to national, regional and local development plans (within the principles of GNH).
Environment: **Pollution control** **Waste Management** **Water Management** **Biodiversity** **Natural Assets**	Investments and developments in the Basin-2 area are integrated into the natural environment / Landscape by giving a high priority on the quality and limitations of ecosystems in the area of influence and minimizing negative environmental impacts. Biodiversity inventoried in the area of influence of planned Basin-2 hydropower investments is enhanced and actions leading to irreversible losses are prevented.
Social Infrastructure	Improving the livelihood of the people by providing better heath services, education, employment opportunities, recreational facilities, better communication and financial services.
Agriculture/Forests	Ensure minimum loss of agricultural land and Government Reserve Forest lands while ensuring an adequate supply of land for all future demand as per the relevant laws of the Kingdom.
Culture and Heritage	A. Cultural heritage values and sites are protected and promoted as social, historical and economic assets. B. Cultural heritage and cultural fabric in the areas of influence is not affected by the development and migration/displacement have minimum negative impacts
Security	Measures to enhance existing security relationships with neighbour states to ensure that security risks do not erode economic/social development options and potential.

5. ASSESSMENT OF GNH IMPACTS (ENVIRONMENTAL, SOCIAL, ECONOMIC, CULTURAL, SPIRITUAL AND GOOD GOVERNANCE)

5.1 IDENTIFICATION AND SELECTION OF DEVELOPMENT ALTERNATIVES

This section of the SA Report details development alternatives proposed by process participants and considers the likely environmental and socio-economic impacts (GNH impacts) expected from the selected (preferred) alternative(s). The section also proposes reasonable measures that would be required to manage and mitigate identified issues and impacts likely to become apparent as the proposed developments and investments are realised in the area of influence and the selected focus areas over the 20-year temporal framework of the assessment.

1. All proposed alternatives share common features that have shaped all scenarios constructed by process participants. These are described below:

2. The proposed developments are focussed in two distinct zones described as the Wangdi-Phodrang Punakha area to the north and a southern area bordered by the Phibsoo Wildlife Sanctuary to the East and encompassing a wide area to the north and west of Lhamoizingka and the Punasangchu River.

3. All process participants considered that development in areas adjacent to the Damphu to Sarpang and Gelephu road would also benefit from the catalytic effect of hydropower developments on Basin-2.

4. Risks related to climate uncertainty, flooding events and risks related to possible and catastrophic Glacial Lake Outburst Flooding events shaped the process leading to the elaboration and eventual selection of alternatives.

5. Process participants structured their proposed alternatives relative to National and sub-national development priorities.

The preferred alternative was selected on the basis of the alternative's contribution to sustainable development objectives described in the 10th Plan and detailed in sub-national plans (including structural plans).

5.2 DESCRIPTION OF THE PROPOSED ALTERNATIVES OVER THE AGREED TEMPORAL AND GEOGRAPHIC SCOPE OF THE ASSESSMENT

Development alternatives/options identified by process participants during the first consultative workshop and later refined during the second consultative workshop are described below:

Alternative-1: ***Wangdue-Punakha (including Gasa) develops as a tourism as well as services hub. Southern focal area develops as a tourism and industrial area.***

Description of alternative-1:

Alternative-1 has a distinct tourism focus. The Northern focal area comprising an area extending north from the site of the Punasangchu-1 Hydropower project includes the current urban areas of Wangdue-Phodrang and Punakha and also includes the Mochhu and Phochhu River basins to their headwaters in Gasa Dzongkhag.

A Southern focal area was located by participants north of the border areas adjacent to Lhamoizingka (Kalikhola) and extending West along the new roads being constructed to Phuntsholing via Raidak and Manitar the Punasangchu River north to Sunkosh Bridge and the Eastern regions including the Phibsoo Wildlife Sanctuary, Tsirang and Sarpang Dzongkhags (with a focus on areas adjacent to existing road networks).

In this alternative Wangdue-Phodrang and Punakha develop as a tourism hub capitalising on its distinct cultural and climatic advantages. Gasa Dzongkhag, located within the Jigme Dorji National Park develops distinct nature based tourism products and services tourism demand from its neighbour Dzongkhags to the south and also provides recreational services to an increasingly wealthy population from Thimphu.

The Wangdue-Punakha area also develops a vibrant services sector providing specialist services to the tourism sector and demand from increasing settled populations drawn to the area by hydropower developments.

The Southern focal area capitalises on improved road networks developed to link the border areas at Lhamoizingka to Wangdue-Phodrang, Tsirang, Sarpang, Phuntsholing and Gelephu. The area also capitalises on planned hydropower reservoirs resulting from the Sunkosh Lift and Sunkosh 4000 hydropower projects to develop water based tourism and water based transport services.

Agro-based industries are established in areas adjacent to Lhamoizingka and in suitable areas adjacent to the Damphu to Gelephu roads. A new high-end tourism area is planned and developed at a location immediately north of the Phibsoo Wildlife Sanctuary on the banks of the Sunkosh Lift Reservoir.

Lhamoizingka expands to become a major entry and distribution hub servicing central Bhutan.

Participants developing this alternative forecast the following points:

Gasa Dzongkhag develops a niche market based on community-based ecotourism where the local communities are directly involved in the tourist management and are benefitting from it. The Dzongkhag also develops as a recreational area for the local tourists (especially near by Dzongkhags). The different product packages offered are (amongst others): Organised and serviced camping areas in the vicinity of the hot springs; Organised trekking; High-end and mid-range lodge type accommodation on trekking routes; Cultural site visits; Photographic treks; Bird watching; Farm stay holidays with traditional experience; Organic farming; River based activities such as rafting and hydrospeed; Concession based tourism activities and others.

Both **Punakha and Wangdue** develop full-fledged tourism cultural and water-based tourism industries. Hotels and resorts are planned in selected sites adjacent to the Punasangchu, Mochu and Pochu Rivers. Hotel, resort and recreational sites and amenities are located in suitable and GLOF safe areas. Expansion of Wangdue-Punakha leads to expansion of the financial services sector and the establishment of numerous businesses and service centres.

Tsirang and Dagana Dzongkhags develop agriculture based tourism industries with water-based tourism along the Punasangchhu – Sunkosh basin. The central location of Tsirang precludes development of tourism service facilities and those tourism investments that are attracted to the area will cater primarily to business tourism and farm stay tourism.

Development of **Sarpang Dzongkhag,** over the temporal framework of the assessment, is focussed on expansion of agro-based industries located in well-serviced industrial estates.

Alternative-2: ***Wangdue-Punakha is developed as a light industry and manufacturing area. The southern focal area is developed for agro-industries and trans-boundary trade centres.***

Description of alternative-2:

Radically different from Alternative-1, this alternative does not have any tourism focus. Process participants chose to address this development

option to test whether a future for the area structured on industrial development, manufacturing, trans-boundary trade and agro-based industries could deliver optimal development outcomes for the area of influence and its population.

To this end, participants developed the alternative over the 20-year temporal framework and considered that:

There would be a significant expansion of private sector activities that would lead to improved income generation opportunities both for investors and employees. The alternative developed considered that the industrial and manufacturing base would emanate from agro-based industries. The overall outlook over the 20-year time frame would be a generalised improvement in the living standards of the population.

On the negative side, participants considered that the alternative would be counter to national sustainable development principles in that it would lead to: Increased land transformation; Deforestation to make additional land available in identified development focus areas; increased demand on natural resources (renewable and non-renewable); increased noise, water and air pollution; increased generation of solid and liquid wastes that would demand the introduction of consequent and effective management and would also require space for the installation of waste treatment facilities. Participants also considered the likely implications of this alternative on the cultural integrity of the population.

Alternative-3: ***Wangdue-Punakha develops as a major urban centre with international and national standard services in tourism and a focus on East-West South distribution hub. The southern area is developed as an entry port and SEZ/Industrial area.***

Description of alternative-3:

The Alternative foresees that the urban areas of Wangdue and Punakha merge to form a single urban entity within the 20-year time frame of the assessment. The principal activity is focused on tourism and service delivery to the tourism sector and hydropower sector as demand for services increases of the assessment period. Wangdue-Punakha receives and distributes goods arriving from the SEZ in the southern focal area.

In the southern focal area, the alternative considers the establishment of a functional Special Economic Zone (SEZ) that serves to stimulate investments in specialized light industry, manufacturing and agro-based industries. The SEZ includes a “dry port” and becomes an entry port and hub servicing the central region of Bhutan. The SEZ and “dry port” are connected to the Wangdue-Punakha conurbation, the East and West by an efficient network

of highways. A network of district and feeder roads links outlying settlements to the principal trunk roads.

The Alternative was described by Process participants as:

Series of town planning phases are completed over the assessment period ultimately merging Wangdue-Punakha town. Distances between other urban areas and districts are further reduced through improved road network and road tunnelling. Service industries, high-end international standard hotels are established and new tourism products developed to cater to both national and international tourists. Some administrative headquarters moved to Wangdue-Punakha. Recreational facilities are created and a major urban centre and serve as distribution hub for east, south and west. The southern area becomes a SEZ with the establishment of an international airport, railway connectivity and the establishment of a dry port and development of industrial area in the south to derive maximum benefit from the hydropower developed along that basin.

Alternative-4: ***Wangdue-Punakha services international and national tourism and is an East-West-South trade and distribution hub. The Southern focal area is developed as a Special Economic zone and industrial area.***

Description of alternative-4:

Alternative-4 is similar to Alternative-3 but its focus is on expansion of the tourism and trade sectors and does not consider expansion of Wangdue-Punakha into a larger conurbation over the 20-year time frame of the assessment.

Process participants charged with the elaboration of a development scenario relative to this alternative focused on the following salient points:

1. The alternative would lead to the creation of a more dynamic tourism sector based on the national principles of 'high value and low volume', balancing economic development and preservation of culture heritage. Participants considered that expansion of a vibrant tourism industry in the area of influence would boost employment opportunities and contribute towards poverty alleviation.

2. The alternative would lead to the establishment of small-scale industries resulting in broad based growth. The Wangdue area would develop into a market centre and service provider as efficient trade and transit routes to neighbouring districts like Trongsa, Zhemgang, Bumthang were expanded and developed.

3. The Southern focal area would be developed into a Special Economic Zone through the enhancement of business development services. These would identify and promote investment opportunities, enterprise and skills development and the establishment of one window clearance system.

4. The alternative would also lead to the expansion of surface transport infrastructure such as highways, road and bus terminals; all aimed at providing safe, clean and increasingly affordable access to public transport services.

5.3 REJECTED ALTERNATIVES AND RATIONALE FOR REJECTION

Once development scenarios for each of the four proposed alternatives were completed and presented, discussed and debated in plenary session, participants were requested to vote for their two preferred alternatives. The voting process was by secret ballot and results were tallied in the presence of all participants.

The voting procedure showed that there was a clear preference for Alternative 3 and the second ranked alternative was Alternative-4. As such, participants agreed to merge alternatives 3 and 4 and elaborated a preferred alternative described below in section 5.4.

The table below details the reasons and logic (evoked by stakeholders) for either rejecting or retaining the various alternatives:

ALTERNATIVE	REASONS FOR REJECTION
Alternative 1: Wangdue-Punakha (including Gasa) develops as a tourism as well as services hub. Southern focal area develops as a tourism and industrial area.	• **Process participants rejected** the alternative given that it did not include sufficient elements to fully capitalise on development opportunities in both the focal areas and the overall area of influence considered in this assessment. • Participants also considered that the alternative was missing critical connectivity to external and internal markets provided by the establishment of a "dry port" at Lhamoizingka (Alternative-3).
Alternative-2: Wangdue-Punakha is developed as a light industry and manufacturing area. The southern focal area is developed for agro-industries and trans-boundary trade centres.	• Process participants did not consider that the attributes and comparative advantages of the area would be best served if development focused on industry and manufacturing. • Participants considered the alternative missed the tourism dimension. • As such, **Process participants rejected** the alternative.
Alternative-3: Wangdue-Punakha develops as a major urban centre with international and national	• **The Alternative was retained** and merged with Alternative-4 below to elaborate the preferred alternative detailed in section 5.4 of this report. • Participants considered that Wangdue-Phodrang and

standard services in tourism and a focus on East-West South distribution hub. The southern area is developed as an entry port and SEZ/Industrial area.	Punakha would merge into a large urban area within the 20-year temporal framework of the assessment. • Participants considered that establishment of a "dry port" in Lhamozingkha (Kalikhola) would be likely within the temporal framework of the assessment. Furthermore, participants considered that a "dry port" would significantly enhance economic development opportunities of the central Dzongkhags (the area of influence).
Alternative-4: Wangdue-Punakha services international and national tourism and is an East-West-South trade and distribution hub. The Southern focal area is developed as a Special Economic zone and industrial area.	• **Process participants chose to retain** this alternative and voted to merge Altrnativ-4 to Alternative-3. • The merged preferred alternative is detailed below in section 5.4 of this Report.

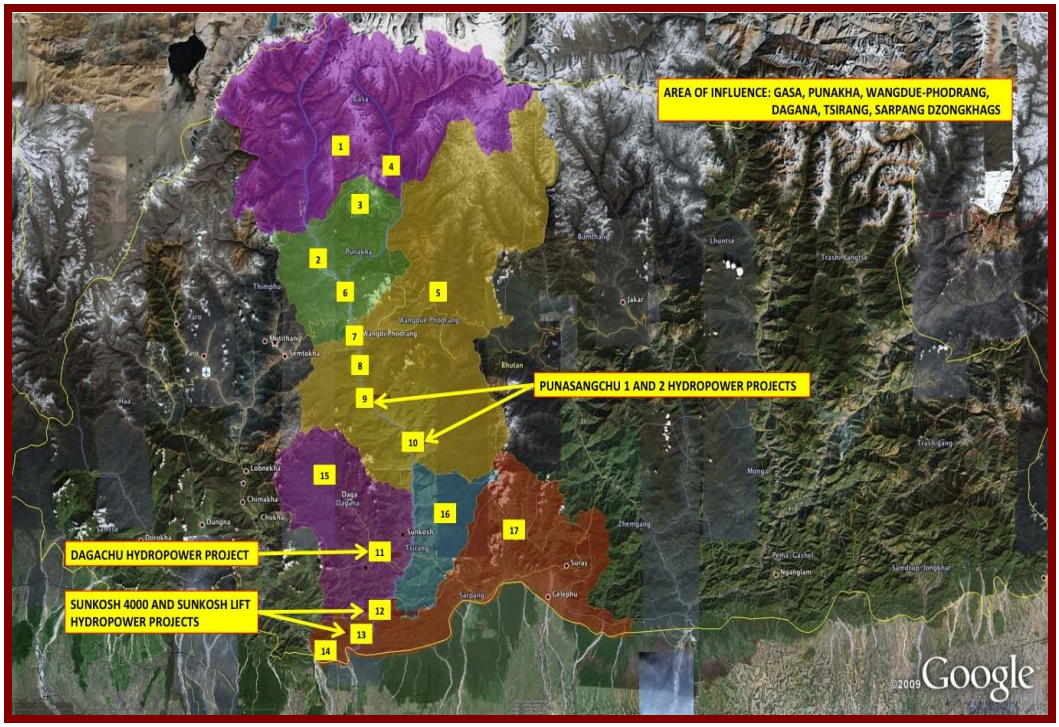
5.4 THE PREFERRED ALTERNATIVE

The preferred development alternative selected by process participants is detailed below. As mentioned previously, this alternative is the result of the merging and reformulation of Alternatives 3 and 4 described above in section 5.2.

PREFERRED ALTERNATIVE (*Merged Alternatives 3 and 4)*
WANGDUE-PUNAKHA AND GASA DEVELOP INTERNATIONAL AND NATIONAL STANDARD SERVICES IN TOURISM WITH WANGDUE-PUNAKHA AS A MAJOR URBAN CENTRE (CONURBATION). **THE SOUTHERN FOCAL AREA DEVELOPS AS A TOURISM AND INDUSTRIAL AREA, SPECIAL ECONOMIC ZONE AND ENTRY PORT.**

5.5 DETAILED DESCRIPTION OF THE PREFERRED ALTERNATIVE

Figure-xx: Principal features of the Area of Influence considered during the Strategic Assessment



ITEM NUMBER	DECRIPTION
1	Gasa Dzongkhag
2	Pochu River. GLOF risk
3	Punakha Dzongkhag
4	Mochu River. Extreme GLOF risk
5	Wangdue-Phodrang Dzongkhag
6	Punakha Dzong and Town
7	Wangdue Dzong and Town
8	Punasangchu River
9	Punasangchu-1 Hydropower Project
10	Punasangchu-2 Hydropower Project
11	Dagachu Hydropower Project and Reservoir
12	Sunkosh 4000 Hydropower Project with its 52 km. reservoir
13	Sunkosh Lift Hydropower Project with its 13 km. reservoir
14	Lhamoizingka development area. Border crossing to India
15	Dagana Dzongkhag
16	Tsirang Dzongkhag. Highway connecting Wangdue to Sarpang and Gelephu.
17	Sarpang Dzongkhag. Regional airport and Jigmiling Industrial Estate. Phibsoo Wildlife Sanctuary to the West bordering the Punasangchu/Sunkosh River.

DESCRIPTION OF THE AREA OF INFLUENCE:

Gasa Dzongkhag and the Jigme Dorji National Park define the northern limits of the area of influence. Gasa, Lunana and Laya regions are both the source areas for the Punasangchu River and are integral to the National Park. As such they remain undisturbed and development is limited to non-impacting economic development such a nature-based tourism and limited agricultural activities.

A northern area, namely the Wangdue and Punakha valleys, Wangdue-Phodrang and Punakha Dzongkhags is designated as a development focal area and expands as tourism investments; services, light industries and trade distribution facilities are established.

The area between Wangdue and Sunkosh Bridge (a linear distance of 70 kilometres) remains virtually free of development except for a Hydro compound to be established on a 36-hectare site at a location known as Pinsa.

A southern focal area comprising Dagana, Tsirang and Sarpang Dzongkhags are likely to undergo major physical and occupational transformation as a result of: Hydropower developments on the River basin; the establishment of a Special Economic Zone, industrial estate and support services in the

Lhamoizingka (Kalikhola border area), expansion of agro-based industries in Tsirang and Sarpang; Development of high-end and mid-range tourism facilities benefitting from established reservoirs and the southern conservation areas; further development of transport infrastructures; improved trans-boundary and national connectivity and finally the probable establishment of a regional airport at Lhamoizingka.

The area of influence is likely to also extend East to Gelephu (including Jigmiling) and West towards Phuntsholing.

Process participants were requested to construct development scenarios for the selected preferred alternative. The edited results of this exercise are detailed in the sections below. The scenario constructed describes development in the area of influence over the 20-year temporal framework of the assessment.

A. State at Time-0 (2009):

Economy: International tourism is gradually expanding. A limited number of hotels and resorts exist or are being constructed but these are generally not to international standards. There are no recreational facilities in place except for a few rough soccer fields. Most of the population resides in rural areas and practice subsistence farming. Trading limited to consumer goods, agricultural produce and limited exportable goods such as potatoes. Social service facilities to resident populations are limited and of low standard Dzongkhag and Geog administration are increasingly effective as their role and responsibilities are adjusted in line with the decentralisation process.

Transport & Communication: The roads network is functional but characterised by narrow roads. Traffic volumes are low and there is connectivity to the Eastern Dzongkhags to the West (Thimphu, Phuntsholing roads are being planned to connect Lhamoizingka to Phuntsholing via Manitar and to Daga and Wangdue via Geserling. A fast north-south trunk road linking Lhamoizingka to Wangdue aligned in a position adjacent to future reservoirs on the Punasangchu River are not considered at this time. During Tenth Plan feeder and farm roads will join major settlements within the basin. In the south the proposed regional airport at Gelephu would be initiated. Segments of the southern East-West highway will be constructed. A possible rail connection linking the Samtse to Samdrup Jongkhar remains a distant option yet to be considered. A rail link joining Pasakha to the rail Network in India has been agreed and an Industrial Estate proposed for Jigmiling could be initiated.

Environment & culture: The state of the environment in the area of influence and both focus areas is still pristine although impacts attributed to farm road construction and the disposal of spoils from hydropower projects and urban expansion are rapidly becoming an issue requiring urgent

attention. Further impacts are being generated from the construction of high-tension transmission lines, rural electrification infrastructures and urban expansion of the major population centres such a Wangdue and Punakha. Culture and tradition remains undiluted and well preserved.

Urbanization: Urbanization still in its infancy with heavy state support for planned city/town development at Khuruthang and Bajo. Lobesa, Rurichu and Nobding just growing into satellite towns. Lobesa is expanding rapidly as a result of demand for space and structure generated by the Punasangchu-1 hydropower project.

Major projects/activities: Punasangchu hydropower project Phase I initiated with a surge in immigrant workers population along River basin concentrated between Khuruthang and Lanitsawa. Convergence of local trading population in same area mostly engaged in consumer goods trading. Local contractors mostly employed in minor civil works provided by PHPA. Plan is on way to build a new hospital at Rinchengang and expand Rinchengang CPS. Private and GRF land along Tsirang Wangdue highway frozen for private building construction to ensure land required for the project is available. *Similar freezing of development along proposed Sunkosh affected area needs to be considered urgently*.

B. State at T+5-years (2014):

Economy and development: By 2014, the Tenth Five Year Plan will have been completed and Eleventh Five Year plan launched. The tourism sector will have developed considerably in the Wangdue-Punakha area with the addition of a number of international standard hotels, resorts and lodges. Eco-tourism trails and supporting infrastructure are place in suitable locations in the area of influence. Gasa Dzongkhag will have rehabilitated and expanded facilities at Gasa Tshachu and opened few more nature and trekking trails increasing possibilities for revenue generation by rural populations. GDP doubles due to Industrial Estates and the injection of money into the economy resulting from the economic multiplier effect of major hydropower projects (Punasangchu I, II, Sunkosh, Mangdechu, Kuri-Gongri, Chamkharchu I and II, Dagachu and Kholongchu) under construction. In the agriculture sector, the production of cereals would slump owing to a production shift towards in cash crops.

Major projects/activities: The Punasangchu-I hydropower project will be midway through its construction. The Punasangchu-II and Sunkosh multipurpose hydropower project will have been initiated.

Demography & settlements: Immigrant and migrant workers population will have reached 20,000 and will be concentrated in areas downstream of Lobesa till Pinsa. In the lower focal area immigrant and migrant population will be concentrated at Samakhola, Homakhola and Kerabari area. Local

Bhutanese population engaged in project related works and trading reaches about 5,000. Wangdue-Punakha is slowly merging as a major urban area with economic activities centred on trading, construction and tourism services. Rurichu, Lanitsawa and few pockets of settlement become established in the vicinity of major hydropower building sites. Pressure on social services and public service facilities increase drastically, especially education, health services, roads and drinking water.

Strategic & Social infrastructures: Bridge construction begins to improve the connectivity of Wangdue and Punakha. A study to assess the feasibility of a road tunnel connecting Thimphu (the administrative capital) and Punakha-Wangdue is commissioned and executed. 95% of rural Bhutan is now fully electrified; Primary education facilities are available to nearly 100% of the population; Health infrastructures are in place though staffing would still be deficient. The North-south road (Thimphu-Gelephu-Dagana-Lhamoizingka) is completed or nearing completion. Telecommunication facilities and Internet services are available throughout Basin-2. All Geog centres in the basin are reachable by all weather roads. Most major settlements in Basin II have farm / feeder roads.

A decision is made to initiate tunnelling between Wangdue-Punakha and Thimphu and between Paro and Thimphu to reduce time required for travel between these cities, improve connectivity and reduce transport costs.

Environment & Culture: Major earth cutting and excavations along the basin leading to increased landslides, siltation of rivers and streams due to the dumping of spoils, road inconveniences, loss of vegetation and loss of biodiversity. The pressure on forest resources increases significantly as a result of increasing demand from the construction sector. Air, water pollution and solid wastes generation increase significantly in line with increased population and economic activity.

Cultural dilution becomes increasingly evident. The traditional joint family system disintegrates. Money begins to dominate traditional cultural values and the erosion of traditional value system becomes apparent. Erosion of the traditional family structure and value system leads to an increase in small-scale criminality.

C. State at T+10-years (2019):

Economy & development: The 11th Five Year Plan is completed and evaluated. The 12th Five Year Plan has been prepared using mainstreaming and consultative techniques (now used systematically at all levels of government) and has been launched. The Punasangchu-I and II, the Dagachu, Kuri Gongri and the Kholongchu hydropower projects are completed, commissioned and begin to generate significant revenues to the Kingdom of Bhutan. Dependence on foreign development assistance is terminated.

Foreign Direct Investment and Funding will still be required to finance mega-projects such as hydropower development, transport infrastructure, a railway linking the border Dzongkhags, airports and GLOF risk mitigation works. The balance of trade statistics show very significant positive growth. In the Wangdue-Punakha focal area, light industries, food processing, tourism and service industries are the principal sources of employment and revenue generation. Gasa Dzongkhag diversifies their nature-based offer of tourism products and service both national and international tourism markets. Gasa develops a line of products based on health and wellness and begins culturing medicinal plants (including the means to culture and sustainable harvest of Cordyceps sinensis) to enhance revenue generation opportunities of rural and distant communities. At the national level, the private sector expands and becomes the principal contributor of the national economy. Government takes up the responsibility of macro-planning regulatory functions. The rural economy will be predominated by cash earning activities in agriculture and livestock and food security will become more vulnerable. Dependence of food grains from India and other neighbouring countries will increase with a decline in national production.

At this time, construction of the Sunkosh 4000 and Sunkosh Lift multipurpose projects is still on going in Basin-2. Hydropower projects in other Basins are identified, planned and under construction. Industrial estates and Special Economic Zones planned and developed in the Southern focal area become operational and investors begin constructing their facilities.

Demography & settlement: Khuruthang and Bajothang towns merge as a result of settlement and increased population density. There will be migrations from neighbouring districts and villages to the urban centre. The gradually over crowding of the merged town will see increased pressure on the existing services and facilities which will need to be expanded. The living standards of the people would have increased significantly.

Strategic & Social infrastructures: Bridges connecting the Punakha-Wangdue conurbation is completed. Road tunnelling begins between Thimphu and Punakha-Wangdue town. 100% of rural Bhutan comes under on-grid electrification; Primary education facilities are readily available to 100% of the population; Health services and facilities are in place and qualified staffing is increased. North-South road (Thimphu-Gelephu-Dagana-Lhamoizingka) is completed. Telecommunication facilities covered all corners of Basin II. All Geog centres in the basin are reachable by roads. Most major settlements in Basin II have farm / feeder roads.

The road from Lhamoizingka to Geserling needs to be replaced with more direct trunk roads, preferably aligned on both banks of the water bodies created by the Sunkosh 4000 and Sunkosh Lift hydropower/water management projects. Interior connecting feeder roads network will need to be expanded. Investments for the establishment of ports/ferries will need to

be considered. Other employment generating activities on the periphery of the reservoirs (aquaculture, tourism, transport services, etc.) will be identified and created as these activities come on line.

Environment & Culture: Major earth cutting and excavations along the basin would be completed and soil stabilization begins to take place. Restoration of lost vegetation and studies and protect wild life in the affected regions is completed. Lessons learned are applied to other Basins where hydropower development projects are either being implemented or planned. Forests are threatened by increasing demand for timber and forest cover targets stipulated in the Constitution of the Kingdom of Bhutan are at risk. Air and water pollution increase in areas with insufficient management and treatment facilities. Solid waste disposal becomes severe issue owing to population concentration along the basin.

Cultural dilution becomes increasingly evident, joint family system disintegrate. Money dominates and loss of value system.

Investments must be made by the projects or the Department of Forest to re-vegetate damaged areas on river basins subjected to hydropower development, road construction and urban expansion. Recreational sites and green belts need to be developed all along the highways in the Basin. Biodiversity Inventories and robust natural resource management will need to be systematically applied to support and assure sustainable expansion of the tourism sector.

D. State at T+20-years (2029):

Economy & development: Four Five-Year Plans have now been completed. National Revenues are the principal source of financing. The Private sector becomes main engine of economic growth. Food security is enhanced through the introduction of high yield agriculture methods. The reliance on food and grain imports decreases as both the agricultural and agro-industrial sectors diversify to meet national demand.

The south comprising Dagana, Tsirang, and Sarpang is developed as a Special Economic Zone with an emphasis on small and medium industries. Heavy industries generating limited pollution would be encouraged but allowed only on completion of rigorous impact assessment and verification that proposed environmental management procedures are within pre-defined standards and norms of the SEZ. The SEZ would be provided with power generated in Basin-2 and industries will be encouraged to source raw materials locally. Aquaculture, water based tourism and recreation products and water-based transport services will be encouraged and promoted. Scope for additional industrial development areas in the southern area of influence will be identified and developed. In the rural areas (farming community) promotion of agro-based and NWFP based small and medium industries will

be promoted. Tsirang and Dagana will be declared as areas exclusively for certified organic farming.

Construction of the two Sunkosh multipurpose hydropower projects is completed and the facilities commissioned. Bajo-Khuruthang town becomes fully functional with increased trade activities and becomes distribution hub for the other neighbour districts. Economic activities in the south increase with: The completion of SEZ's; the construction of functional international and regional airports at Lhamoizingka and Gelephu; Railway connectivity to all Southern Dzongkhags and from these to the Indian National Railway network; and the establishment of "dry ports" to facilitate trade. Economic activities have now diversified to meet national and international demand. Aquaculture and water based recreation becomes very prominent. Investments must still be made for improving the connectivity from rural pockets to the trunk roads.

Demography & settlement: Khuruthang and Bajothang town have merged and opportunities generate increased rural to urban migration from neighbouring districts and villages. The rapidly expanding population will result in increased pressure on the existing services and facilities that will need modernisation and expansion. The living standards of the population have improved significantly. Investment will be required to develop and upgrade water supply networks, wastewater and solid waste management systems. Urban and satellite town development will have to be strictly regulated through agreed structural and development plans. The concentration of population in the urban and semi-urban areas will call for stricter security and social service facilities. The Central government relocates key Ministries to Wangdue-Punakha given the existence of the rapid tunnel road between Thimphu and the conurbation.

Strategic & Social infrastructures: Bridges connecting the towns of Khuruthang, Wangdue and Lobesa are completed. Road tunnelling between Thimphu and the Punakha-Wangdue conurbation is completed town significantly reducing travel time between Thimphu and Paro and enhancing connectivity to the Eastern Dzongkhags. All communities and settlements in Bhutan are now electrified; Primary and secondary education facilities are available to all; Health infrastructures and services are readily accessible and the average age of the population increases significantly. New fast trunk roads linking Lhamoizingka to Wangdue Punakha are constructed opening opportunities for new tourism developments on the banks of the Sunkosh 4000 and Sunkosh Lift reservoirs. The North-South road linking Wangdue to Gelephu is upgraded to international highway standards. The Road linking Wangdue to Daga, Geserling and Lhamoizingka is downgraded to a principal District road. Telecommunication facilities covered all corners of Basin II. All Geog centres in the basin are accessible by good quality roads with assured year-round passage. All principal settlements in Basin-2 are connected to the highway and trunk road network through all season farm / feeder roads.

Trans-boundary transport and communication would have been improved tremendously through the national southern railway, multiple rail links to India and a Southern East –West highway that complements the rail network. The Southern East-West Highway serves to distribute goods and services to communities and businesses adjacent to rail stations and transfer stations. The cost of fuels encourages trucks to opt for "truck on flatbed railway solutions". The Government invests strategically to expand public transport infrastructures.

Environment & Culture: Major earth-moving works in the Basin are completed. Impacts generated from the disposal of spoils (dams, roads, tunnels) have been reduced as a result of a policy of re-use and recycle. Historical spoil dump areas are either restored or stabilised. Impacted areas are converted to plantation forests. Demand for timber products continues to expand and loss of natural forest is offset through plantation forests.

Air, and water pollution remain critical issues that require continuous upgrading of treatment facilities and controls to enforce national emission standards. State of the Art solid waste management is systematically introduced to all urban, and industrial areas.

Security issues: With the opening of the south as the entry point for trade and commerce and with the expected huge movement of goods and people there will be security issues both external and internal to the people and properties. This will demand government to reinforce security measures in border areas and elaborate innovative border management procedures to facilitate the safe movement of people and goods. At T+20 it is highly likely that friendly relations between India and Bhutan will have evolved to an open border policy with joint security procedures to assure the safety of the population.

5.6 IDENTIFIED RISKS

Process participants were requested to consider elements of risk that would or could have a bearing on their proposed scenarios.

For the purpose of the Strategic Assessment, risk is treated as an event that could have a direct or indirect impact on development forecast for any given scenario. In addition, the element of risk is categorised as **likely, unlikely or uncertain** within the temporal framework of the assessment. The element of risk is also categorised according magnitude of the event and treated as either **critical** or **not critical.**

In all cases, identified risk must be mitigated and managed. Selected management and mitigation measures must be systematically introduced to both Dzongkhag and National Development Plans (Five-Year Plans and Annual Plans).

If an element of identified risk were both critical and uncertain then it would preclude any investment or development in areas likely to be affected by the risk element in question.
The Strategic Assessment identified Glacial Outburst Flooding of Basin-2 as a critically uncertain risk and therefore demands that risk areas be identified and regulated to exclude all structural or infrastructure development. Management options are described in Section-7 below.

RISK CATEGORISATION

Process participants identified the following Risk elements:

ISSUE	DIRECT	INDIRECT	T-0	T+5	T+10	T+20	COMMENTS
GLACIAL LAKE OUTBURST FLOOD (GLOF)	YES	NO	CRITICAL UNCERTAINTY				High risk of GLOF outburst at any time. Catastrophic consequences to downstream settlements and infrastructures.
RESERVOIR INDUCED EARTHQUAKE	YES	YES	UNCERTAIN				Reservoir Induced Earthquakes have been reported from the Region (RFS). A major Quake such as China could have significant and catastrophic downstream impacts.
CLIMATE CHANGE	YES	NO	LIKELY AND CRITICAL				Global warming: Drying up of water sources. Increased incidence of flooding events.
ENVIRONMENT	YES	YES	LIKELY				Environment degradation: Water, air, soils, natural resources, landscape.
SECURITY	NO	YES	LIKELY				Increasing migration to urban areas. Increased transboundary movement of construction workers. Transboundary issues: resource based and political.
POPULATION EXPLOSION	YES	YES	LIKLEY AND CRITICAL FROM T+10				Rural-urban migration, influx of labours

Hazards due to Glacial Lake Outburst Floods on the Mochu, Pochu and upper Punasangchu Rivers have been partially mapped by the Department of

Geology and Mines of the Ministry of Economic Affairs. Hazard mapping and impact characterisation has been supported by the Netherlands Climate Assistance Programme (DGM-NCAP Project to Prepare Hazard Maps of the Punasangchu River from Khuruthang to Lhamoizingka).

The DGM-NCAP project has identified 5 potentially dangerous glacial lakes on the Mochu Basin and 9 potentially dangerous Lakes on the Phochu River Basin. The Hazard mapping activity, reported by Karma in 2003 (**www.nlcap.net/fileadmin/NCAP/Resources/Bhutan_presentation_IPM08.pdf**), classifies riverbanks into high, medium and low risk areas and provides an indication of the economic, social and environmental impacts that could be expected.

Concerns regarding the possibility of **Reservoir Induced Earthquakes** generated as a result of the creation of the Sunkosh 4000 and Sunkosh lift reservoirs needs to be seriously considered. Proximity of the reservoir sites to the Indian Plate subduction zone could lead to aggravated earthquakes increasing the risk of dam failures, catastrophic flooding and structural damage to adjacent structures. A revision of construction norms and standards to strengthen earthquake resistance in areas likely to be affected will have to be carried out and strictly enforced.

For the purpose of this Strategic Assessment it is strongly recommended that Structural Plans, Spatial Plans and other periodic Development Plans integrate the findings of the Department of Geology and Mines to ensure that high-risk areas remain free of structural development and recommended in this report.

5.7 MACRO-ZONATION OF THE NORTH AND SOUTH FOCUS AREAS

Annex 12.2 details the salient features and conditioned macro-zonation of the northern and southern development focal areas selected by process participants.

The Annex also describes a digital cadastre based development and impact management procedure that could be applied in the Kingdom of Bhutan to: Support effective and timely environmental management; track environmental reporting according to agreed schedules between investors and relevant authorities; integrate sectoral information into a single information system; lay the foundation for a national GNH information exchange system.

5.8 DESCRIPTION OF THE EXPECTED IMPACT ON NATIONAL SUSTAINABLE DEVELOPMENT OBJECTIVES (LOCAL, REGIONAL AND NATIONAL)

Process participants unanimously selected the preferred alternative as the one most likely to deliver optimal develop outcomes at the local, regional and national levels. The development scenario described in section 5.5 above is a likely and realistic opinion of how development is likely to be shaped by the selected alternative.

In addition to the constructed scenario, participants were also requested to consider the contribution of the alternative to national development objectives at Local, Regional and National levels. The opinion of process participants is presented below.

Overview of the Development Outcomes at T+20 years:

Through investments and expansion of a tourism oriented private sector, expansion and improvement of public sector services, the development of a functional and operational trade hub in Wangdue-Punakha, the establishment of a Special Economic Zone in Lhamoizingka, investments in manufacturing and light industries in the Southern focal area, diversification of the tourism offer in the South and improved transport options and infrastructures, it is expected that significant benefits will be accrued to both Dzongkhags in the area of influence and to the Nation as a whole. The proposed development alternative would lead to increased revenue generation, employment, improved standards of living, enhanced environmental management, poverty alleviation and ultimately contribute effectively to National GNH goals.

At the Local Level: The preferred development alternative would contribute to planning and investment aimed at a generalised improvement of basic amenities and public services. Merging of the Wangdue and Punakha urban areas into a single municipal structure would assure coherent development planning, expansion and cost savings resulting from the construction of common facilities such as: Waste water treatment plants; Sanitary Landfills; Sewerage; Underground electrical transmission lines and distribution points; Shopping recreational centres.

Investments in the tourism and services sectors will lead to increased employment and a generalised improvement in the livelihood of the population.

Recognition that Glacial Lake Outburst Floods (GLOF) would result in catastrophic destruction of structures and infrastructures in identified risk areas would lead to a revision of existing Structural Plans of all urban and peri-urban areas in the risk areas. Identified GLOF risk areas would be

delineated and treated as public recreational sites. Public safety would be guaranteed by n effective warning system operated and maintained by designated State institutions.

At the Regional Level: The preferred alternative would lead to the design and development of an efficient transport infrastructure comprising: Fast North-South trunk roads connecting the border areas to Wangdue-Punakha, Thimphu and the Eastern Dzongkhags; Improved connectivity would be enhanced through construction of an East-West railway linking South-Eastern Trashigang (Jampani) to Sibsoo-Samtse Dzongkhag in the West; Regional and international airports at Lhamoizingka and Gelephu respectively; A road tunnel linking Wangdue-Punakha to Thimphu; Introduction of water based transport on reservoirs created through construction of the Sunkosh 4000 and Sunkosh Lift hydropower project and expansion of District, feeder and farm roads linking near and distant communities/settlements.

The alternative would also lead to improved delivery of financial services to all communities in the area of influence. In addition, there will be increasing demand for local agricultural products to meet the requirements of a growing urban and peri-urban population and that of the tourism sector.

The Region will become an economic engine for regional and national growth. As such, the region will become a driver of rural-urban migration and partly responsible for population shifts that could lead to a reduction of agricultural production, contribute to national food insecurity and the transformation of rural landscapes through abandonment.

Regardless of the negative aspects of the alternative, Process Participants considered that its contribution to sustainable development (GNH) objectives at the regional level outweighed the negative aspects, which they considered could be managed systematically and effectively.

At the National Level: The preferred development alternative would lead to: Increased GDP and a concomitant decreased need to secure financing from external sources and cooperating partners.

The Alternative would also contribute significantly to: National poverty alleviation targets; National development targets specific to employment, education, service provision, life expectancy, state of the environment, disaster preparedness; industrial development; economic diversification; balance of trade and others.

6. ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS

Stakeholders forecast likely environmental and socio-economic impacts likely to become apparent as a result of the realisation of their preferred alternative over the geographic and temporal scope of the Strategic Assessment. The section below represents the exact and consensual opinion of Process Participants. The analysis is considered correct for the purpose of this Assessment and represents their opinion based on their expert judgement.

Predicted impacts are characterised and grouped according to type and are consistent with scenarios constructed for the preferred alternative. Appropriate management and mitigation measures for each identified impact are proposed in Section-7 of this Report.

1. Urban Expansion

The development scenario foresees rapid expansion of the Wangdue-Punakha urban areas and gradual expansion Lhamoizingka in line with the establishment of a Special Economic Zone, Industrial Estates and expanded adjacent agricultural areas. Likewise, the preferred development option forecasts expansion of Tsirang, Sarpang, Gelephu, Damphu and Daga.

Though urban growth is forecast in all existing urban areas, the principal expansion will be in Wangdue-Punakha that will absorb all villages between Punakha and Wangdue and Lhamoizingka during the latter stages of the 20-year temporal framework.

Process participants predicted that the following impacts would become apparent as a result of urban expansion and population growth:

Environment and Socio-economic impact characterisation:

- **Land Transformation:** Conversion of Government Reserve Forest or settled land to accommodate urban expansion. Resettlement and compensation of resident populations could be envisaged.
- **Solid Waste:** Significant increase in solid generated wastes from both residential and non-residential areas; Disposal of building waste becomes an issue; Increase in domestic waste and packaging; Significant increase in organic waste.
- **Waste Water:** significant increase in wastewaters and sewage generated by residents and business users; Continued use of septic tanks leads to contamination of groundwater supplies;
- **Water Pollution:** Contamination of wells and ground source potable water as a result of infiltration due to surface cleaning (roads and

vehicles); contamination due to illegal waste water dumping; contamination due to inappropriate disposal of waste oils; Contamination due to accidental spills (fuels, oils, chemicals, fertilizers, pesticides, etc.); Direct discharge of untreated waste water impacts the Punasangchu River and its tributaries impacts aquatic biodiversity and water quality.

- **Air Pollution:** Expected from vehicle emissions and waste incineration and inappropriate waste disposal; Increased use of fuel wood.
- **Noise Pollution:**
- **Natural Resources:** Extraction of building materials (aggregates, stone and boulders, Cement, wood products); localised resource depletion; Landscape changes; Impacts on the sustained provision of ecosystem services.
- **Public Health:** Increased Prevalence of HIV/AIDS in populated areas; increased incidence of communicable diseases.
- **Incompatible Development:**

2. Tourism Sector

Currently the tourism industry in the area of influence is underdeveloped relative to its physical, natural and cultural attributes. As National and local infrastructures develop it is expected that investment in the tourism sector will expand rapidly with a concomitant significant increase in both positive and negative impacts resulting from that growth.

Environment and Socio-economic impact: While tourism enhances environmental protection, employment and income generation. It is expected that there will be a significant increase in water consumption, waste generation, energy consumption, groundwater contamination, air pollution and cultural erosion. Likewise there is a possibility for the prevalence of HIV/AIDS to increase in adjacent areas. A rapid and significant increase in tourism in the area of influence could result in increased costs of living for local inhabitants and increasing land values making access to land difficult to local residents. Increasing social marginalisation.

The preferred alternative foresees a rapid expansion of international standard hotels, resorts and lodges in the northern and southern focal areas of the area of influence. Lower standard hotels and inns servicing local and business market segments will also become established in significant numbers. The sector will also result in the establishment of recreational facilities (amusement parks, cinemas, restaurants, etc.) all of which will require space, generate waste and social change. Participants also indicated that they considered a significant increase in farm stay facilities (Gasa Dzongkhag) likely.

Expansion of the sector will also lead to the establishment of tourism support services such as: Industrial laundries, tour operators, vehicle rental

companies, service garages, food distribution; suppliers of construction material; furniture and kitchen suppliers; and others.

Impact characterisation for the tourism sector:

- **Solid Waste:** Disposal of building waste; Domestic waste and packaging; Organic waste and excess food disposal.
- **Waste Water:** significant increase in wastewaters and sewage generated by tourism facilities. On average internal water consumption per guest night will range between 130-300 litres (toilets flushing, kitchens, laundry, shower/bath, drinking water) External water use per guest night (landscape, external cleaning, swimming pools and spa's, car washing) are likely to increase pollution loading of groundwater sources and only required increased treatment capacity if discharged to sewer lines. External water use volumes for international standard hotels will be similar to and additive to internal use consumption[1].
- **Water Pollution:** Contamination of wells and ground source potable water as a result of infiltration from inadequate or low capacity septic tanks.
- **Air Pollution:** Vehicle emissions and waste incineration and inappropriate waste disposal.
- **Land Transformation:** Conversion of Government Reserve Forest or settled land to accommodate tourist resorts, lodges and camps; Resettlement of resident populations could be envisaged.
- **Natural Resources:** Extraction of building materials (aggregates, stone and boulders, Cement, wood products); localised resource depletion; Landscape changes; impacts on the sustained provision of ecosystem services.
- **Public Health:** Increased Prevalence of HIV/AIDS in areas adjacent to tourism facilities**.**

3. Transport Sector:

The Roads Master Plan foresees gradual expansion and improvement of the National roads network to provide services and connectivity to all communities, cities and settlements in the National territory. This assessment considered the current roads network and forecast infrastructure development over its 20-year temporal framework. Process participants including representatives from the Ministry of Works and Human Settlement – Department of Roads considered the current Plan including the proposed road linking Lhamoizingka to Geserling, Daga and Wangdue-Punakha and recognised that the road should be reconsidered in

[1] Dakers, A; D. Lees; R. Cullen and G Meyer-Hubbert (2006): Impact of Tourism on water and wastewater services in small towns. Tourism Research Recreation and Education Centre. Lincoln University – New Zealand.

light of the demands of the preferred alternative. As such, process participants have suggested that a new alignment for a fast trunk road linking Lhamoizingka to Wangdue-Punakha be identified at a safe distance on the Eastern banks of the Punasangchu River and its future reservoirs.

Environment and Socio-economic impact characterisation: Roads development will result in significant environmental and socio-economic impacts throughout the study area. These are detailed below and specific to each infrastructure type foreseen in the Strategic Assessment.

a. Trunk Roads: The prospective analysis carried out by process participants foresees a rapid trunk road connection from Lhamoizingka north towards a connection with the Wangdue-Punakha highway at Sunkosh Bridge. Impacts related to this road would be: Land transformation; Limited loss of Government Reserve Forests along and adjacent to the alignment; generation and disposal of spoils due to the cutting and construction process; Waste generated by construction crews; Incidence of waste following commissioning of the road including litter increases; Increased incidence of wood cutting and wildlife depletion in areas adjacent to or made accessible by the trunk road; Pollution of surface waters, tributaries and streams as a result of waste oils and fuels disposal (roadside repairs); Incidental spills of chemical and toxic wastes (accidents); Increased prevalence of HIV/AIDS in areas serviced by the infrastructure; Possibility of ribbon type development in areas adjacent to the infrastructure.

b. Feeder Roads: Impacts generated by the construction and expansion of the National network of feeder roads in the area of influence are similar to those described above for trunk roads.

c. Farm Roads: Impacts related to farm roads are again similar to those above but limited primarily to the disposal of spoils generated during construction and later during periodic maintenance. Ribbon development in areas adjacent to farm roads will be unlikely given that the end purpose of these roads is to provide access to markets and basic services (health, education) to distant settlements/communities not services by higher-grade infrastructure.

4. Future Infrastructure Types/Options: The prospective development scenario constructed by process participants forecasts a number of infrastructure developments that could be realised within the temporal framework of the assessment. Impacts that could be expected from these are listed below:

a. Road Tunnels: Rapid economic development of the Wangdue-Punakha conurbation will require fast and efficient transport links to Thimphu and Paro airport. Participants considered that the most

appropriate solution would be to construct a road tunnel linking Thimphu valley to the Punasangchu River valley. The tunnel would be constructed from a point east of Lobesa to a point west of Thimphu. Tunnelling distance would be between 10-15 kms. A feasibility distance given technologies currently applied to the construction of tunnels in "run of the river" hydropower projects.

Impacts expected from tunnel construction would be a significant volume of spoils that would require innovative disposal. Localised air pollution from the concentration of vehicle emissions being vented from the tunnel; limited land transformation and loss of Government forests in cleared areas at either extremity of the tunnel (parking areas, safety/administration infrastructure, truck inspection and weigh stations, rest areas). The tunnel would be the preferred routing of most vehicles. As such there will be reduced impact to sensitive areas adjacent to the present "over the top" road. The existing road would be maintained and used when the tunnel is closed for maintenance or for oversized vehicles or vehicles carrying dangerous or volatile cargos.

b. Water based Transport: Construction of the Sunkosh 4000 and Sunkosh Lift hydropower and reservoir projects will lead to the creation of two large reservoirs extending from a point 14 kms north of the border with India to a point near the confluence of the Dagachu River with the Punasangchu River. Together the two reservoirs will result in navigable reservoirs extending 13 kms. And 52 kms respectively (in a rough north-south alignment).

Process participants considered that water based transport should be considered as a future multimodal transport solution in the area of influence. Constructed scenarios envisaged several transport opportunities:

1. **East-West ferry Crossings:** Several ferry crossing would be established between the eastern and western Banks of the reservoir. These would be barge type ferries capable of carrying a number of cars and/or trucks. Terminals and settlements would be established on either bank. Ferry crossing would enhance East-West connectivity and transit times.

   Impacts would include but not be limited to: Solid waste generation from settlements and terminals; Waste water; construction spoils (road beds, loading ramps, construction of the settlement and its infrastructure; natural resource depletion (wood cutting, limited habitat loss, impacts to biodiversity); Water pollution (dumping of waste and refuse into the reservoir, oil and

fuels spillage); Limited displacement of populations resident at selected crossing sites.

2. **North South scheduled services (passengers and goods):** Impacts would be similar to those described above for ferry crossings. The number of landing stations constructed on the reservoir would multiply identified impacts.

3. **North-South cruises (tourism);** Cruise services on the reservoir would operate differently and would not result in increased incidence of waste and refuse disposal (collected and disposed on shore); there would be no waste water disposal from the vessels (equipped with holding tanks); oil and fuel spillage would also be limited with the existence of on-board holding and disposal reservoirs. Impacts related to the construction of loading/offloading facilities would still require management and mitigation. Likewise, disposal of wastes and spent oils would require special consideration.

Water based transport, regardless of the type envisaged would require common support facilities that would have to be constructed or established at suitable locations on the banks of the reservoirs. These include ship repair facilities, fuelling facilities and waste disposal and management facilities.

Boatyards can generate significant waste including fine particulates (metal, paint, anti-fouling paint); waste oil and grease; oil contaminated water (bilge water); scrap of various types (metal, wood, electrical wiring; plastics; etc.); Waste generated by boatyard workers.

Fuelling facilities can result in chronic spillage into reservoirs. Specific mitigation and management techniques will have to be developed (see Section-7 of this Report).

c. **Regional Airports:** Development of the airport at Gelephu has been announced since the completion of the participant discussions. This airport will require an EIA that will identify all likely environmental impacts and measures for their mitigation.

Process participants did identify an option to construct a regional airport at Lhamoizingka. This airport would complement transport infrastructures and also service Phuntsholing via the new road via Manitar.

Construction of an airport at Lhamoizingka would be inscribed in a Structural Plan for the development of Lhamoizingka including: Its support infrastructure; Special Economic Zone; Urban expansion areas;

Recreational areas; Industrial Estates; etc. Impacts directly attributed to a future airport will include but not be limited to: Land take and land transformation; Noise pollution; Air pollution due to aircraft emissions; Contamination of ground water supplies in the event of fuel spillage or aircraft wash down; Building waste and spoils; Solid waste and waste water.

d. Railways: Participants in both the present Strategic Assessment and the Strategic Assessment to consider the likely development consequences of proposed Industrial Estates in Samtse Dzongkhag considered that Bhutan would be well-served by a railway connecting Sibsoo (western Samtse Dzongkhag) to Jampani (Eastern Trashigang Dzongkhag). The proposed railway would be constructed parallel to the border with India and would traverse on a least cost direct routing. The routing would require transit through the Phibsoo Wildlife Sanctuary, the Royal Manas National Park and the Khaling Wildlife Sanctuary. Transit through these National conservation assets is possible if construction and operation follow strict guidelines (which will need to be defined in consultation with RSPN)

An electrical railway could be an optimal transport solution for southern Bhutan. It requires limited land take, is easily controlled and managed and can serve to move goods and passengers (including trucks on flatbeds) to strategic connections to fast north-south trunk roads. The proposed option draws on ample power generated by current and future hydropower projects in Bhutan.

Impacts related to a rail option would be primarily related to the construction phase and limited to land take, construction spoils and limited deforestation of conservation assets. A railway would not pose a threat to wildlife as a result of speed restrictions within conservation areas. The railway would be single track with double track at intervals to allow safe passing of opposing trains. Construction will be self-contained from bed and rail construction rolling stock. The construction train would be provided with track and ballast from behind (already laid track). Ballast would come from existing quarries and rails (100 metre sections) pre-assembled on sleepers and laid by the construction train.

A rail option in Southern Bhutan becomes an interesting option as fuel costs for road transport increase and are reflected in the overall price of transported goods.

5. Agriculture and Fisheries Sector

The preferred alternative will lead to expansion and diversification of agricultural production in the area of influence. There will be a

significant increase in commercial farming practices and expansion of agro-based industrial output.

Aquaculture (fish farms) could be established on or adjacent to the Sunkosh reservoirs.

Environment and Socio-economic impact characterisation:

Depletion of Natural Resource Inventories: Conversion of land to agricultural use; Increased settlement of areas with agricultural potential with a concomitant increase in deforestation through clearing and for fuel wood supplies; Fragmentation of critical habitats and ecosystems increases.

Deforestation of critical basin catchments: Increased sedimentation of streams and rivers as a result of upstream erosion; ecosystem services expected from catchments are diminished; Potable water resources (during periods of drought) are reduced.

Pollution of surface waters: Chemical pollution due to increased use of fertilizers and pesticides; Contamination of near surface drinking water supplies;

Fisheries: Depletion of wild stocks of commercial species in the Punasangchu River and its tributaries; Conversion of land for the purpose of aquaculture; increased charcoal production for treatment (smoking) of wild and farmed fish products.

6. Industrial Sector

Economic development priorities, trans-boundary agreements and site-specific advantages of the Lhamoizingka area lead to the establishment of a Special Economic Zone supported by satellite Industrial Estates. Investors benefit from locally available raw materials and produce goods for both national and international markets. The focus is on light manufacturing/industries, assembly and agro-based industries.

Service Industries and distribution centres are established in the Wangdue-Punakha area servicing the northern focal area, Thimphu, Paro and the Eastern Dzongkhags.

Environment and Socio-economic impact characterisation:

Solid Waste: Disposal of building waste; disposal of by-products, packaging, etc.; contaminated organic waste from abattoirs and meat processing facilities.

Waste Water: Disposal of high BOD effluents. Effluents with high chemical and heavy metal concentrations (Tanneries).
Emissions: Gaseous and particulate emissions that can be unpleasant and dangerous to populations in adjacent areas.

Depletion of Natural Resources: Increased woodcutting for charcoal production in adjacent areas; Resource fragmentation due to construction of the infrastructure and designated industrial areas; deforestation resulting from increased timber extraction.

Cultural Erosion: Rural to urban migration; Cultural dilution Rural communities fragmented as a result of migration.

Increased prevalence of HIV/AIDS in industrial areas with a significant influx of foreign workers could become apparent.

7. Mining Sector (Mines and Quarries)

Development of the area of influence resulting from the preferred alternative together with ample generated power and an effective transport infrastructure will open up the area to exploration and later investment to supply raw materials to industry established in the southern focal area.

Environment and Socio-economic impact: Expansion of the mining sector (assuming the existence of mineral resources) could lead to increased environmental pollution and depletion of critical natural resources. It is expected that these would be offset by the rigid application of existing/strengthened laws. Expansion of the mining sector in the area of influence could lead to a significant contribution to the GDP and employment.

Environment and Socio-economic impact characterisation:

Degradation of natural resource inventories: Damage to sensitive areas resulting from exploration; Increased hunting and poaching; Displacement of wildlife stocks away from natural habitats if these are being explored/exploited.

Solid waste and Spoils disposal: Domestic, industrial and overburden could be generated in significant quantities and will need proper and agreed disposal methods.

Increased pollution of surface waters and air (if mining is operational): The type of environmental impact expected would be dependent on the type of mining undertaken.

Depletion and fragmentation of forest resources: Mining and the development of infrastructure to support mining will contribute significantly to depletion and fragmentation of forest resources in the area of influence

Cultural Erosion: Cultural dilution; Immigration and migration; Rural communities fragmented as a result of migration.

8. Energy Sector

The Assessment recognises that the energy sector is the driver of change and development of Basin-2. The Assessment does not consider the direct and construction based impacts of hydropower development on the Punasangchu River given that these are covered by Environmental Impact Assessments specific to each hydropower project.

For the purpose of this assessment we consider the wider development impacts directly related to the hydropower projects on the area of influence and over the temporal framework of the assessment.

Environment and Socio-economic impact characterisation:

Impacts will be attributed to increasing population and settlement in the area of influence (the economic drawing factor of the projects). Impacts will include but not be limited to: Expanding urban areas; investment in service based industries to support the hydropower sector (Garages and repair facilities; Die-casting and small parts production; cleaning and laundry services; catering services; Financial Services; vehicle sales and rentals; Recreational Services; etc.); increased import and consumption of packaged domestic goods; increasing demand for water; increasing pressure on existing services and utilities; Land take for hydro related settlements, transmission lines and electricity distribution networks; depletion of natural resources; increased incidence of water, air and soil pollution; increased solid waste and waste water generation; cultural dilution and erosion in both urban and rural areas; increased and unstoppable rural to urban migration.

9. Health Sector and Public Health

The preferred alternative foresees the construction of new hospitals, clinics and dispensaries. Likewise it foresees the expansion of existing facilities to cater for increasing population in the interim. This expansion will be associated to impacts that will need to be mitigated and managed. Predicted impacts are detailed below.

Environment and Socio-economic impact characterisation:

Construction of new health facilities or expansion of existing facilities will require land and access to infrastructure (electricity, sewerage, water and communication); During construction there will be building spoils and wastes that will need to be processed. Following completion, impacts will be primarily related to the treatment of solid waste, wastewater and toxic/hazardous waste. Of these the most difficult to handle will be the latter which will require either on-site incineration or safe transport to a designated incineration facility. Transport of hazardous waste could lead to off-site pollution incidents in the event of accidents or spillage.

Expected impacts in the Health Sector can be summarised as follows:

- Contaminated hospital waste requiring specific disposal methods: Contaminated waste, wastewater and sharps requiring special disposal criteria.
- Increased incidence of communicable diseases as population density increases in areas serviced by the infrastructure.
- Increased Prevalence of HIV/AIDS in areas serviced by health infrastructures.

10. Finance Sector

Barter system and cash trade is still in existence in the area of influence. As the area develops and roads infrastructures become available to all communities there will be expansion of the financial services sector concomitant with increasing household incomes and wealth.

Environment and Socio-economic impact characterisation:
Impacts directly related to improved access to funds and to increasing household incomes are likely to be:

- **Degradation and Fragmentation of natural resource inventories:** increasing demand for forest and non-forest resources linked to enhanced household incomes and increasing population density.
- **Increased levels of Waste Generated:** a direct result of increasing household incomes.

11. Natural Resources

As population in the area of influence increases in line with rapid and focused economic development, it is likely that there will be an initial surge in the exploitation of natural resources (licensed and un-licensed). The surge will be brought under control as National Laws and regulations are but eventually laws will be enforced to protect natural resources. The risk of overexploitation will remain and its control will require the concerted efforts of all concerned administrations.

Environment and Socio-economic impact characterisation:

Infrastructure development in the area of influence facilitates natural resource management (the area is now easily accessible to managers and inspectors). The infrastructure also makes the resources easily available to potential users and, as such is likely to lead to increased demand, use and eventual localised depletion. Rural to urban migration will lead to localised depletion in areas adjacent to urban areas but, resources in population depleted rural areas will be auto-protected as a direct result of decreased demand.

7. MANAGEMENT AND MITIGATION MEASURES

7.1 PROPOSED MANAGEMENT AND MITIGATION MEASURES (NECESSARY TO ACHIEVE SUB-OBJECTIVES AND MEET NATIONAL STANDARDS)

Environmental and socio-economic impacts expected from the preferred development option and described in Section-6 above were grouped into impact categories. Management measures necessary to mitigate these impacts are detailed in the table below.

The recommended management and mitigation measures described below are necessary to offset predicted impacts. As such, each identified management and mitigation measure should be considered a pre-condition to licensing and must be embedded systematically into Dzongkhag and National Development Plans (5-Year Plans, Annual Plans, Spatial Plans, Structural Plans, etc.)

PREDICTED IMPACTS	MITIGATION AND MANAGEMENT MEASURES
Increased Production of Solid Waste	• The preferred disposal technique shall be in planned sanitary landfills; • Where land for sanitary landfills are not suitable then alternative methods such as: Baling; Incineration or new Gas Plasma Incineration techniques can be considered. **From the Tourism Sector:** • Tourism operators and hotel owners are required to apply waste reduction policies; • Tourism operators are made responsible for separation and treatment of their wastes. • Compositing of organic waste. • Disposal to designated waste disposal facilities in each Dzongkhag or Municipality; • Inspections to verify waste management schemes are carried out periodically at each property/operation. **Urban and Industrial Waste:** • State of the art sanitary landfills are constructed in suitable areas adjacent or proximal to all urban areas;

	• Treatment and disposal according to waste characterisation in designated Dzongkhag or Municipal sanitary landfills. • Industries are made responsible for pre-treatment of waste generated within their facilities; • Industries settling in the area should be required to introduce clean production methods to minimise waste. • Waste recycling, where possible will be made mandatory; • Periodic site and process inspections are mandatory and carried out by a designated authority. **Dzongkhags:** • Dzongkhags should identify suitable locations for sanitary landfill sites and composting sites on a high priority basis. • Sanitary landfills should be planned, financed and constructed. • Operation and maintenance should be contracted out to experienced operators. • Waste collection and treatment fees should be introduced to encourage waste minimisation at all levels. **Geogs:** • Solid waste management should also be introduced systematically; • Suitable long-term solutions must be identified for smaller settlements and rural areas; • Collection and consolidation schemes could be considered. Collected refuse would then be transferred periodically to designated landfill sites; • Waste from smaller settlements could also be collected and baled periodically. Bales can be used to re-contour valleys to increase agricultural potential. **Profit from Waste Initiatives:** • National and Dzongkhag Authorities should encourage and support the establishment of waste recycling SME's. • Residues from Gas Plasma Incineration

	can be recycled as tarmac aggregates (a glassy substance is all that remains from tons of waste). No toxic emissions.
Toxic and Hazardous Waste	**From the Health Sector:** • Disposal of all toxic and hazardous wastes from hospitals, clinics and dispensaries shall be according to agreed and licensed procedures. • The NEC will issue licenses and be responsible for periodic monitoring. • Disposal shall not be permitted in sanitary landfill sites or any other common licensed disposal site; • Illegal disposal shall be tracked and sanctioned severely; • High temperature incineration shall be the preferred disposal technique. **From the Industrial Sector:** • Industries shall be responsible for pre-treatment of their hazardous waste or the proper and legal disposal of the materials. Disposal shall be according to best international practice; • All toxic and hazardous waste resulting from any industrial or commercial process shall be signalled prior to licensing, • Standing control regulations shall apply and shall be enforced by the relevant authority; • The NECS shall verify compliance and enforce regulations (which may include suspension of a license in the event of repeat irregularities)
Increased Wastewater Volume Generated	Increasing population in the area of influence, increasing investment in tourism, light industry, and service industries increases demand on water with a concomitant increase in generated wastewater in both the northern and southern focal areas. **Urban and Industrial Waste:** • Suitable locations for tertiary waste water treatment facilities are identified in each urban area and in the Wangdue-Punakha conurbation;

	• When possible, wastewater treatment facilities shall be located away from residential and tourism areas. • Treatment plants shall be located down-slope to minimise the need for pumping (added cost); • All urban areas shall be connected to waste water treatment facilities through dedicated sewerage networks; • Soak-away pits and open latrines will be discontinued and replaced by septic tanks in areas where connection to treatment facilities is difficult. • Industries should be required to pre-treat their effluents prior to discharge to official treatment facilities. Effluents must meet national standards (detailed in the Water Act of 2010) prior to discharge. • Discharges of untreated wastewater and sewage into receiving waters shall be prohibited. **From the Tourism Sector:** • Lodges, Camps and Resorts located in areas distant to Municipal/District wastewater treatment facilities will be required to have on-site treatment to national standards. • Mini-treatment plants shall be the preferred treatment method; • Wastewater treatment shall be specified and agreed prior to licensing. The NECS shall be responsible for monitoring and inspection following commissioning of each self contained treatment plant; • Discharges of untreated wastewater and sewage into receiving waters shall be prohibited. Discharges will be tracked and the responsible party will be sanctioned heavily (fines, penalties clean-up and restoration costs); • All wastewater treatment facilities (regardless of size) shall be subject to regular inspection by a designated authority. **Dzongkhags:**

	• Dzongkhags should identify suitable locations for wastewater treatment facilities on a high priority basis. • Land for the facilities should be secured on a high priority basis; • Wastewater treatment facilities should be planned, financed and constructed. • Operation and maintenance should be contracted out to experienced operators. • Water treatment and sanitation fees should be introduced to offset operating costs. • All discharges of untreated effluents to receiving waters should be suppressed within an agreed period of time.
Increased Volume of Construction Waste	Economic growth in the area of influence will result in increased physical development (construction, building rehabilitation, infrastructure development). There will be significant volumes of building wastes generated that will need either recycling or adequate disposal. **Districts:** • Areas designated to receive building wastes should be identified on a high priority basis; • Building waste should be crushed and recycled as building aggregates if suitable for that purpose; • Fiscal incentives should be provided to waste recycling enterprises; • Crushed building waste should be used for construction of roadbeds to offset cost and reduce damage due to the proliferation of aggregate quarries.
Increased Volume of Spoils	The principal source of spoils requiring handling and proper disposal will be: Road works; Tunnels; Hydropower projects; Excavations; Site preparation works; and others. **Treatment and disposal:** • Disposal in valleys, on riverbanks and other natural areas is not feasible. Spoil disposal from the Punasagchu-1 Hydropower project is already a major issue with inadequate disposal altering

	riverbeds, increasing downstream siltation and destabilising banks. Disposal in lateral valleys leads to biodiversity loss, alteration and blockage of smaller watercourses and damage to critical forest resources. • Efforts should be crushed, sorted and re-used as building materials and aggregates. • Spoils can generate a profitable aggregates business. • Spoils re-use policies can significantly reduce damage to forests and natural resource depletion likely to result from increased number of quarries and aggregate businesses.
Land Conversion/Transformation	Current land use in the area of influence will be significantly altered as demand for land to accommodate urban expansion; infrastructure development, industrial development and others increase over the temporal framework of the Strategic Assessment. **Management and Mitigation:** • The National Land Commission, together with Dzongkhag administrations should carry out or update their land and land use inventories; • Land management priorities should be defined within the area of influence and in particular in the northern and southern focal areas; • Currently ongoing cadastral surveys to develop a National Digital Cadastre should be carried out in the area of influence and its focal areas on a priority basis; • Land for specific development types (tourism, residential, industry, recreation, agriculture, forest, conservation, etc.) should be identified and reserved for that purpose only. Developments incompatible with the designated use **must be prohibited** as a means of stimulating and protecting investment and quality of life; • GLOF risk areas identified by the

	Department of Geology and Mines must by delineated and kept free of all structural development. Identified risk areas can be maintained in their current use or converted to green recreational areas (parks, cycle paths, picnic areas, trails, etc) when located within an urban or urban expansion area. • Existing Structural Plans will need to be revised in light of the findings and recommendations of this Assessment; • A Spatial Development Plan for the area of influence and the focal areas should be prepared. The Spatial Plan should incorporate Structural Plans, Infrastructure Master Plans and other relevant Sector specific Plans. • The resultant Plan will identify all designated development zones and describe (in detail) the type of activity permitted and the conditions required for establishment of each development type. • Legislation should be strengthened (as needed) to regulate unplanned settlements and unlicensed land conversion/transformation.
Pollution of Surface Water and Potable Water Supplies	• A register of industries, effluents (sources and types) should be established. The register should be used to track back to polluters should contamination be detected. The Register will be cross referenced to the digital cadastre; • A register of fertilizers and pesticides should be established with reference to use relative to each plot registered on the digital cadastre; • Regulate use of pesticides and fertilizers; • The quality of surface and groundwater supplies should be monitored on a regular basis. • National enforcement detailed in the Water Act and standing National Environmental Regulations should be followed and enforced;

	• The NECS should support Dzongkhag and Geog Authorities through capacity development, technical expertise and systematic monitoring.
Disposal of Waste Oil and Fuels	**National Level:** • Directives should be issued to designate and plan areas designated for the establishment of garages and vehicle service centres. **Dzongkhags:** • Criteria for the establishment of vehicle service facilities should be prepared (relative to National Directives). The criteria will include regulations for the proper disposal of waste oils and fuels; • Inspectors will ensure that garage and service centres respect established operating standards. • A system of fines should be introduced and applied; • Dzongkhag authorities will organise collection of waste oils and fuels on a regular basis. Arrangements should be made to consolidate collections and transfer them to reprocessing facilities. Districts should be paid for each delivery made to the reprocessing facility. The collection and sale of waste oils and fuels to a reprocessing facility will be audited and the results shall be made public. • The waste oil and fuels collection system can be contracted out to suitably qualified enterprises; • Inspectors will patrol the road infrastructure network regularly to ensure that oils are not dumped on the roadside. Appropriate fines should be considered and applied as needed.
Accidental Spills (fuels, oils, chemicals and other toxic materials)	• Accidental spills (due to road accidents and other unforeseen incidents) are unavoidable. Clean up and restoration units should be established and mobilised to respond in the event of accidents. (In most countries the Roads Department supported by the

	Emergency Services have this responsibility). • Accidental spills shall always be reported to the NECS. The NECS shall monitor the site for possible contamination of surface and ground waters.
Depletion of Natural Resource Inventories	• An updated map and inventory of natural resources in the Area of Influence must be prepared (on a priority basis) to enable effective monitoring of natural resource depletion. • Capacity development of the responsible authority will be required. Capacity refers to numbers of available personnel and their technical expertise. • Regular monitoring of the resource base will need to be carried out. Contingency plans will be prepared and corrective measures shall be triggered by the results of monitoring. • Introduction of concerted public awareness campaigns to reduce demand on natural resources. • Introduction of modern and efficient wood burning stoves to reduce demand for fuel wood. Introduction of pelletizing processes using waste wood as part of a wood stove conversion and modernisation process. • Reinforcement of community based natural resource management schemes (Community forests, delegated resource management, community species protection schemes, etc.). • Improved cross border wildlife monitoring in the southern and northern areas of the geographic area. • Coupling resource management objectives to expansion of the tourism sector and supported by benefit sharing schemes and direct employment.
Degradation and Fragmentation of Forest Resources	• Conservation forest areas should be mapped and legally designated. • The routing/location of proposed infrastructures (roads, railways,

	airports, ports, terminals, etc) should be delineated and conditions set for establishment of their rights of way. • Timber cutting for the rights of way should be licensed to a commercial operator and the revenue used for management of forest reserves in the area of influence. • Fragmentation should be mitigated through designation of conservation corridors. • The Forest Department together with forest officers at the Dzongkhag and Geog levels must continue to designate areas where licensed cutting for charcoal production would be permitted. • The capacity of the Forest Department to monitor and manage forest resources should be enhanced through recruitment and training. • Awareness campaigns targeting forest conservation should be designed and implemented. • Plantation forests for charcoal production and local use should be established in collaboration with local resident communities.
Depletion of Biodiversity Inventories and Animal-Human Conflicts	Increased human activities in the area of influence will lead to a reduction in baseline biodiversity inventories. Management and control measures should include but not be restricted to: • Planned human settlement in areas distant from known biodiversity hot-spots or areas of concentration; • Habitat and ecosystem integrity should be considered in all development planning; • Urban expansion areas are planned to maintain habitat integrity and prevent fragmentation; • Speed restrictions and speed control devices applied to sections of the infrastructure known to be in the proximity of or bisecting known

	migration routes and/or known biodiversity concentration areas; • Game fencing in areas that are particularly prone to animal-human conflicts (proximity to the Phibsoo Wildlife Sanctuary and the Royal Manas National Park.
Erosion of Social and Cultural Heritage	Economic growth, migration from rural and distant areas and the influx of migrants to urban centres are likely to lead to social conflict, and a gradual erosion of social and cultural values specific to Bhutan. Management will require the concerted effort of National and Sub-National Authorities and the visible presence of the Monarchy (as protector of cultural and traditional values). The magnitude of the problem should be monitored at the Geog level and followed by social services (schools, clinics, dispensaries) in rural areas. A "State of Bhutan's Rural Areas and Cultural Heritage" should be prepared prior to the preparation of each 5-Year Development Plan. Recommended corrective measures should then be introduced to the National Development Plan.
Migration and Unplanned Settlement	Management measures to avoid the establishment of unplanned settlements in urban areas or ribbon type developments in areas adjacent to the planned infrastructure requires: • Identification and cadastral planning of urban expansion areas in all existing urban centres of the concerned Districts. • Identification of sites suitable for the establishment of settlements in key areas along the routing of the proposed infrastructure. • Cadastral planning of identified sites. • Definition of clear mechanism for the allocation of plots to migrants.

Increase in HIV/AIDS Prevalence	Mitigation measures targeting an expected increase in HIV/AIDS prevalence rates as a consequence of increased mobility of the population, improved roads infrastructure and increased presence of foreign construction workers can include: to road rehabilitation can include: • HIV/AIDS education and prevention messages (radio, billboards) along the route, and prevention activities at truck stops (drama, education sessions, etc). • Health posts at truck stops or outreach health services from the local health centers at truck stops, for the provision of condoms, counseling and testing services, STI treatment, and other basic health services. • Free Condom distribution at truck stops and at hotels

7.2 PRIORITISED DEVELOPMENT ACTIONS IN THE AREA OF INFLUENCE

Process participants considered the likely development outcomes resulting from their preferred development alternative and structured these in a logical sequence in their prospective scenario presented in Section-5.5 above. The sequence of activities required to plan, execute and monitor each identified development action will be similar in each case and will be preceded by a generic set of actions, which should be carried out between 2010 and 2015.

1. Revision of existing Structural Plans to introduce development priorities identified through this Assessment.

2. Elaboration of a detailed Spatial Development Plan for the Area of Influence and the forecast focal development areas.

3. Identification of GLOF risk areas and systematic development prohibition in all current and future development plans.

4. Promulgation of a Law prohibiting construction and physical development in GLOF risk areas.

5. Preparation of a digital cadastre for the area of influence.

6. Agreement on development macro-zones in the areas of influence where only certain types of compatible development will be permitted.

7. Delineation of identified macro-zones on the digital cadastre.

8. Elaboration of information folders describing the development conditionality that must be met (environmental, physical, structural and social) prior to approval to proceed and licensing.

9. Prepare and make available detailed natural resource and biodiversity inventories for the area of influence and the focal areas.

10. Determine the current state of the environment in the area of influence to include: water quality of surface and ground water; air quality and current emission levels; potential risk areas (landslides, GLOF, flood risk, etc.); current noise pollution levels; present use of fertilizers and pesticides; current volumes of waste and wastewater generated; location and type of waste management in the area of influence.

11. Define limits of change for environmental parameters that cannot be exceeded. The limits shall be structured on international standards adjusted to the Bhutanese context (example: Euro-4, Euro-5 emission standards for vehicles).

12. Prepare a specific development Plan and Strategy for the establishment of a Special Economic Zone in Lhamoizingka, complete with urban expansion areas and the location of critical infrastructure and services (roads, waste management, sewerage, power transmission and distribution, residential areas, green areas, recreation areas, rail links and terminals to India, hospitals, schools, etc.)

13. Commission a study to analyse (in detail) the option and feasibility of constructing a railway from Sibsoo to Eastern Trashigang. The Railway, as described in this Report would follow an alignment proximal to the border with India and traverse both the Phibsoo and Manas conservation areas.

14. Convene a public hearing to present the findings of the Railway study (11) and agree on the future of the proposal.

15. Identify suitable locations for sanitary landfills and wastewater treatment facilities to service the future Wangdue-Punakha conurbation. Reserve the location and issue directives to assure they are not allocated to other purposes.

16. Revise the existing Roads Development Master Plan in line with the findings and recommendation of this Report. The Plan should be revised to include the construction of a fast trunk road linking Lhamoizingka to Wangdue-Punakha following the shortest and most appropriate alignment adjacent to the future Punasangchu River reservoirs. The Alignment should allow for development of tourism facilities and services (ferry boat, water transport, terminals) on suitable land between the highest high water mark on the shore and the road.

17. Develop a time-based Strategic Plan for infrastructure improvement and upgrading in the area of influence.

18. Commission a detailed study and feasibility study to determine the most appropriate alignment for a road tunnel linking Wangdue-Punakha to Thimphu. The analysis must include a preliminary social and environmental impact profile of the propose works.

19. Identify and reserve an area suitable for construction of a regional airport in Lhamoizingka.

20. Immediately identify alternatives to spoils dumping on riverbanks, valleys or other natural area. Ensure that future hydropower, road, infrastructure, tunnelling, urban expansion activities are not permitted to dump spoils. The preferred spoils treatment option must be some form of re-use and recycle process with in-built revenue generation opportunities.

21. Initiate marketing and promotion campaigns to attract investment to the focal areas following completion of the Planning processes and the preparation of conditionality information/instruction folders.

22. Agree on Institutional Arrangements for the technical review and approval of license applications for all development types in the area of influence.

23. Agree on the institutional Arrangements for subsequent performance monitoring, state of the environment monitoring and Dzongkhag Performance Audits.

Specific development actions, identified through the above preparatory activities, should be introduced into the 11th Five Year Plan (2014-2019), subsequent Five-Year Development Plans and Annual Plans and budgets derived from these Plans. Introduced actions will be fully mainstreamed thereby reducing their environmental and social impact, enhancing their developmental benefits and reducing downstream corrective and restoration costs.

8. INDICATORS AND MONITORING

The Royal Government of Bhutan gauges its development through a National Indicator set structured on International sustainable development indicator sets defined by international development targets such as the Millennium Development Goals. The Gross National Happiness Commission is currently working on a national set of indicators to measure progress towards its GNH goals and objectives. To these the GNH will add a set of performance indicators to measure the level of achievement, efficiency and continued pertinence of its development programmes detailed in National Development Plans and Annual Plans derived from these.

During the course of this Strategic Assessment it was found that there was considerable confusion regarding indicators among Process Participants. As such, it was proposed (and unanimously accepted) that a different but linked approach be adopted to measure progress in the execution of Plan activities at the Dzongkhag and Geog levels of government. The proposed approach is based on the principles of "Benchmarking" a tool used effectively in the business and industrial sectors and increasingly used to measure progress towards objectives in a variety of different settings (including spatial and socio-economic development).

8.1 BENCHMARKING

The Oxford Dictionary of Human Resource Management[2] describes benchmarking as:

"*The technique of comparing organizations in order to identify 'best practice'. Managers might benchmark their organization in order to assess how it is performing, to identify areas for improvement, and to look for new ideas. The purpose is to identify best practice and to transfer all or part of this to one's own organization. Invariably the transfer process involves adapting the ideas and techniques to industry-specific or organizational-specific circumstances. In theory, any aspects of the organization's operation can be benchmarked, including human resource policies and practices (training methods, equal opportunities policies, remuneration packages, etc.), providing they can be measured in a consistent manner across all organizations being compared."*

"Benchmarking can be applied to many different areas and at many different levels, ranging from the manufacturing industry to public service administration, at individual department or company level, as well as sectoral or policy level. Benchmarking has already been successfully

[2] **A Dictionary of Human Resource Management (2008): Edited by Edmund Heery and Mike Noon. Second Edition. Oxford University Press. ISBN 0-19-829618-5**

implemented as a tool to improve performance in the private sector and, more recently, in the public sector by government administrations and other public institutions".

The principal steps involved in Benchmarking are:

1. The ability to **self-assess** through a clear understanding of an administrations processes and performance in minute detail;
2. To **analyse** implementation, execution and processes relative to agreed development objectives, sub-objectives and targets. To analyse an Administrations performance relative to others (Dzongkhag to Dzongkhag or Sector to Sector) successful processes and performance;
3. To **compare** measured performance against those of others which might have been analysed. To compare measured performance against pre-agreed targets (water quality will not exceed fixed values; health services will be delivered to *x%* of the population; etc.)
4. To identify and **implement** changes to assure that targets are met or performance deficiencies corrected.

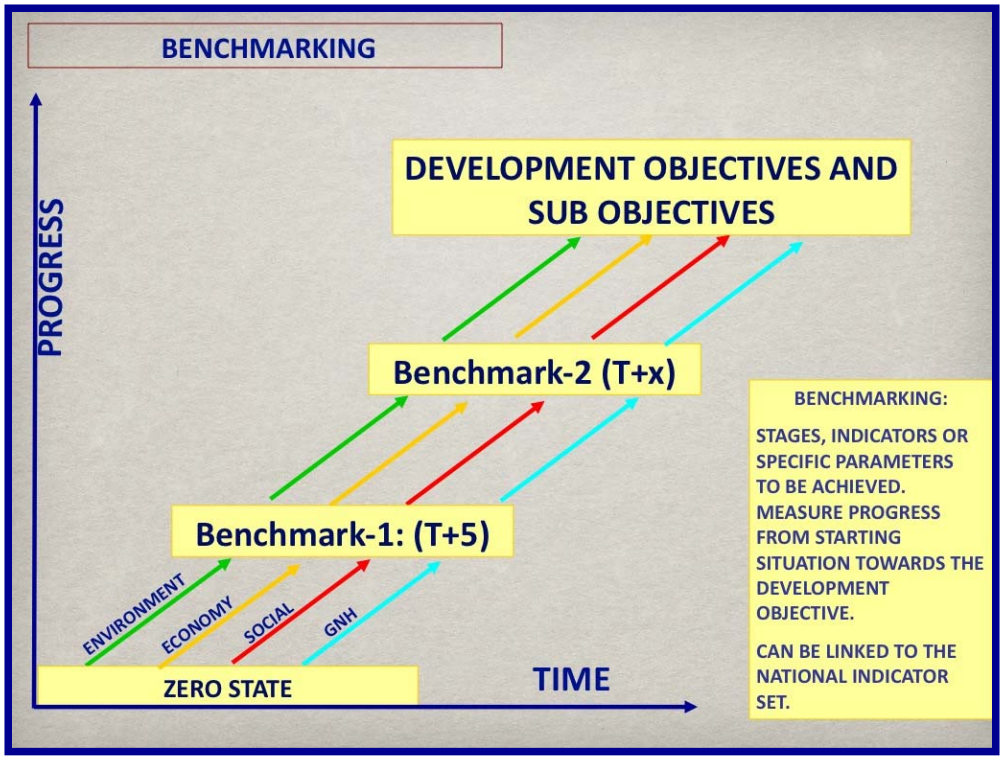


Figure-x: Benchmarking would permit National and Sub-national administrations to set targets according to their Annual or Five-Year Development Plans. The Benchmarks could be specific to planned activities (kilometres of road constructed; number of hospitals constructed or modernised; sector specific Developments; Employment; Education; or any activity specified in the Plan or introduced as a Benchmark).

Since each activity has been mainstreamed to mitigate and manage any predicted **negative** environmental, socio-economic or GNH impact, then a benchmark audit should show that there has not been any deterioration in condition as measured at the "zero-state" (the baseline or reference level for any given parameter).

If during a benchmark performance audit, it is found that there has been deterioration of any reference condition, then it is obligatory to track the source (reason) and introduce corrective measures.

As noted in Figure-x above, benchmarks cannot be separated from agreed National Indicators sets. Benchmarking is an opportunity to introduce measurement systems that are transparent and subject to public scrutiny to create an atmosphere conducive to continuous improvement.

8.2 DZONGKHAG AUDITS

The Concept of Dzongkhag Audits was presented and discussed on conclusion of the second SA process workshop. The purpose of an audit process was detailed and generally accepted by process participants as an effective means of assessing performance relative to benchmarks and targets defined by each Dzongkhag and Geog.

Audits would be carried out by multi-sector teams representing different administrations. Teams must include a representative from the National Environment Commission Secretariat and the National Land Commission. Representatives from Sector Ministries or Administrations would be selected from a roster of certified auditors.

Audit results will be discussed with Dzongkhag and Geog officials in a public session in which local communities are encouraged to participate. Results will: Report performance relative to targets; Identify weaknesses; Identify all cases where targets have deteriorated relative to their reference values and propose remedial actions.

Audit results will be submitted to the GNHC as part of National performance monitoring procedures relative to Annual and Five-Year Development Plans. The GNHC will then confirm receipt of the Audit Report, confirm the recommendations of the Auditors and inform the concerned Dzongkhag accordingly.

Dzongkhag Audit procedures should be agreed b all concerned parties. The Audit process should be tested and refined prior to its systematic application (to be agreed by Dzongkhags in a joint statement).

9. RECOMMENDATIONS

On conclusion of the Strategic Assessment Process, participants shaped the following recommendations to the Joint Commissions based on their collective experience gained from the Process:

1. Stakeholders recommend that all future development planning or analysis of the development consequences of complex investment projects should be subject to Strategic Assessments to ensure that these deliver optimal development outcomes with minimal environmental, and social impacts.

2. Stakeholders recommend that Strategic Assessment Processes be designed and implemented to ensure that all Dzongkhags are provided with the Technical skills to apply the Process systematically to their development planning and to inform their decision-making processes.

   Opportunities to expose Eastern Dzongkhags to the SA Process could be: Proposed hydropower development on Basin-3 and the development of an International airport and Industrial Estate in the Gelephu region

3. Furthermore, Stakeholders recommend that the 11th Five-Year Plan be elaborated on the basis of systematic Strategic Assessments carried out at Sub-National levels to ensure that each constituent element of that Plan is consistent and coherent to National Development objectives, contributes to local development objectives, is fully mainstreamed to mitigate against predicted point source or cumulative impacts.

4. Stakeholders agree that the principal National Institutional driver for ensuring a systematic application of Strategic Assessments (as a mainstreaming instrument of choice) should be the Gross National Happiness Commission. Stakeholders encourage the Commission to draw on experience gained by participants and, in particular the National Environment Commission Secretariat to facilitate dissemination of the Process to Sub-National Administrations, Line Ministries and other concerned parties.

5. Stakeholders recommend that the Gross National Happiness Commission, together with the National Environment Commission Secretariat issue a directive and prepare an SA Process methodology to enable and monitor the systematic application of the Process, or a variant of it, to all complex development projects.

Complex development projects shall include but not be limited to: Transport infrastructure; Strategic infrastructure; Hydropower Development; Urban Expansion; Industrial Developments; National Parks and Conservation Areas; Mines and mineral extraction areas and others.

6. Stakeholder participants strongly recommend that the Roads Department consider designing a new Highway to link Lhamoizingka (Kalikhola) to the Sunkosh Bridge junction on the Eastern bank of the Punasangchu River. The Recommendation is based on the outcome of the Process and the need for a fast North-South Trunk Road link to Wangdue-Phodrang, Punakha, Thimphu and the Eastern Dzongkhags.

7. Stakeholders recommend that the Tourism Board of Bhutan initiate a survey and product development initiative to identify and promote tourism opportunities in the vicinity of the Punasangchu River and in particular in areas adjacent to the highway recommended as item-5 above.

Through the process Stakeholders have identified a significant future tourism resource adjacent to the reservoirs established by the Sunkosh Hydropower Projects, the Phibsoo Wildlife Sanctuary and other natural assets in the region.

8. Stakeholders strongly recommend that all identified GLOF risk areas on the Punasangchu River Basin be categorised as development and investment exclusion areas. Furthermore, Stakeholders recommend that risk areas be designated as “Green Recreation Areas” and developed for that purpose. Development could include: Park-land; Footpaths; Bicycle paths; Nature Trails; Water recreation areas; Planned picnic sites with fire pits; etc.

10. NEXT STEPS

The Strategic Assessment Process has reached an advanced state of completion. The next stages are critical to its successful outcome and validation of its results and recommendations. The steps necessary to complete the process are detailed below:

1. Circulate and adjust this draft Report:

The Draft SA report is completed and circulated within the National Environment Commission Secretariat, the Gross National Happiness Commission and the National Land Commission for review, comment and adjustment relative to received comments.

2. Deliver the adjusted SA Draft Report to NECS:

The Revised and adjusted Draft SA Report is delivered to the NECS, the GNHC, the NLC and the Liaison Office Denmark (LOD).

3. Prepare and National Consultation Workshop.

NECS Officers together with partners in GNHC and NLC prepare a National Consultation Workshop to be held during the month of March 2010. The purpose of the Consultation will be to present findings and recommendations to a broad and representative platform (Line Ministries, Stakeholder Administrations, Dzongkhag representatives, Private Sector Interests, NGO's and Associations and other interested parties).

The National Consultation workshop is an event where Process outcomes and recommendations are discussed, detailed and defended. Participant comments are received, recorded and introduced to the Draft Report as required.

4. Adjust the Draft Report following National Consultation Workshop and circulate to participants to ensure that it continues to represent their consensual choice.

The National Environment Commission Secretariat supported by their Process Consultant prepares the Final Draft Report and circulates to the Report to Process participants to ensure that the Final Version still represents their views and consensual choice.

Once validated by Process participants, the SA Report (Final Draft) is submitted to members of the NEC, GNHC, NLC Commissions in preparation

of a joint Commission meeting to discuss, validate and endorse the Report, its outcomes and its recommendations.

5. Prepare a joint GNHC, NLC, NEC meeting to present the document and process for endorsement:

The NECS prepares and joint NEC prepares a joint NEC, GNHC, NLC meeting and presents the SA Report (Final Draft) to the members.

6. Final Adjustments of the Draft SA Report to prepare the Final Report:

The Final SA Report is prepared following introduction of comments from members of the Joint Commissions.

The Final Report is presented to the NECS representing the Chairman of the Joint Commissions. The NECS confirms that recommended adjustments have been introduced to the Report and issues a Note recommending Endorsement.

7. Prepare a Statement of Endorsement (*to be approved by the Chairperson presiding over the joint meeting)*:

A "*Formal Statement of Endorsement*" is prepared and signed by representatives of the Chairman of the NEC, the GNHC, NLC and submitted to the proper Authority for action.

8. Publish the final Endorsed Report:

The Report detailing the outcome and recommendations of the Strategic Assessment Report of development expected from hydropower development in Basin-2 (The Punasangchu River Basin) is published and made available to: National and Sub-National planning and development Authorities; Line Ministries; NGO's and Associations; and the General Public.

The Report should then contribute to inform Development Planning and permit the introduction of GNH mainstreamed priority actions to those Plans.

9. Prepare a Process Manual describing the SA process developed for the Royal Government of Bhutan:

A tailored and operational Strategic Assessment Process Manual to be used for subsequent Strategic Assessment Processes is drafted and introduced to Local Government Planning Guidance.

11. REFERENCES

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12. ANNEXES

1. THE STRATEGIC ASSESSMENT PROCESS

2. MACROZONING OF SELECTED FOCUS AREAS

3. LEGAL FRAMEWORK FOR THE STRATEGIC ASSESSMENT

4. LIST OF PARTICIPANTS (WORKSHOPS 1 AND 2)

5. THE (ZERO OPTION) SCENARIO

6. PROCESS ACTION PLAN

12.1 ANNEX-1: THE STRATEGIC ASSESSMENT PROCESS

The Strategic Assessment Process carried out to assess environmental, social, economic and overall GNH impacts expected from investments in hydropower projects on the Punasangchu River basin (Basin-2). The Process was specifically tailored to the Bhutanese context and designed to:

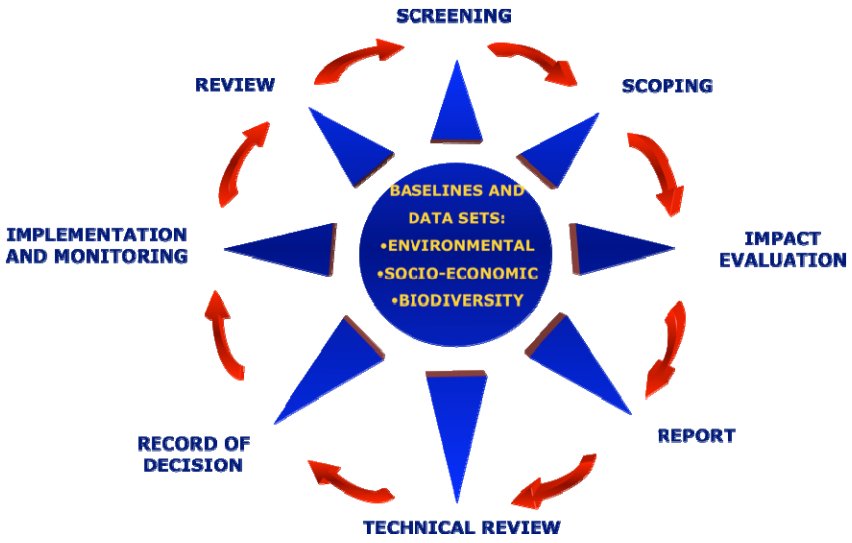
1. Deliver a rapid assessment based on a consultative process involving all institutional stakeholders of concerned Dzongkhags, Line Ministries, private sector interests and civil society.
2. Consider various development alternatives that could result from the current and proposed hydropower investments.
3. Consider the wider development impacts over a pre-defined and agreed area of influence that far exceeded the actual impact footprint of each investment.
4. Extend the scope of EIA's carried out for the investment projects required by the Environmental Assessment Act of 2007, the Regulations on the Environmental Clearance of Projects and the Regulation on Strategic Environmental Assessment of 2002.

A: KEY STAGES IN THE STRATEGIC ASSESSMENT PROCESS

The stages of an SEA/SA process are similar to the stages of an Environmental Impact Assessment (EIA) process. Though the stages are similar, the SA process is very different from the internationally agreed format of an EIA.

The distinguishing attributes of an SEA/SA are that: They are tailored to each specific case; They have inherent flexibility; They require the continued and active participation/consultation of all concerned stakeholders; They consider impacts over a large geographic area and over an agreed and temporal scope that far exceeds the analytical cover of an EIA; They are shaped and contained by an agreed set of Objectives and Sub-Objectives; They consider a number of viable alternatives or development options; They are rapid and require low levels of detail (low data resolution) and finally, their mainstreamed results are the product of consensus and serve to effectively inform planning and decision making processes**.**

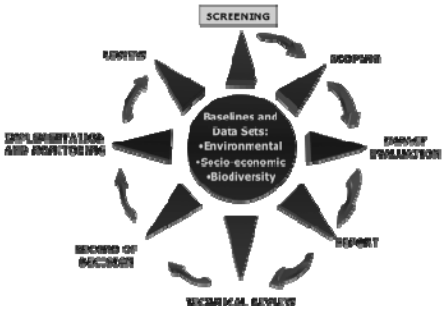
SEA/SA PROCESS STAGES



It should be noted that an SEA/SA process is a "learning" process in which the results of monitoring serve to improve the resolution of outcomes with each cycle. The process should be repeated prior to each planning cycle (prior to each 5-year planning cycle).

Each stage of the process detailed in the graphic above is detailed in the section below.

SCREENING



Policies, programmes, plans, development proposals and complex investments projects (*the object)* are screened by the Environmental Authority or by the proponent Authority responsible to determine the need to subject the object to an SEA/SA process. The screening process requires that the Environmental Authority, the proponent Authority or similar question the object to determine whether:

- The Policy, Plan, Programme, Development Proposal or Complex Investment Project is likely to have significant environmental, social or economic impacts that could be reduced by subjecting it to the SEA/SA procedure.

- The Policy, Plan, Programme, Development Proposal or Complex Investment Project sets an enabling framework or catalyses further projects that will require an EIA according to national legislation.

- The Policy, Plan, Programme, Development Proposal or Complex Investment Project is likely to have significant impacts on societal activities which themselves are likely to result in significant environmental, social or economic impacts (e.g. Expansion of infrastructure, urbanisation, transport, special development zones, settlement in the affected area, etc.).

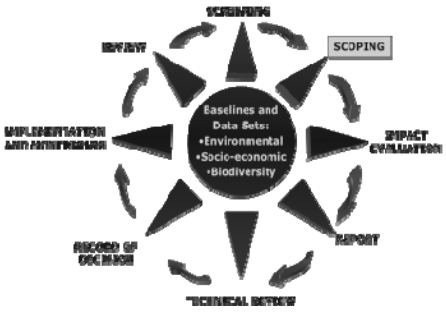
- The Policy, Plan, Programme, Development Proposal or Complex Investment Project is exempt from the SEA/SA process following a clear demonstration that it will not have any environmental consequences.

The National Environment Commission, together with its partners the Gross National Happiness Commission and the Land Commission considered that proposed hydropower developments planned or currently being implemented on Basin-2 were likely to have significant development, environmental, social and economic impacts.

As such, the three Commissions requested that a Strategic Assessment Process be initiated to:

- **Identify and mitigate environmental, social and economic impacts;**
- **Inform development planning processes at both the Dzongkhag and Central levels of Government and**
- **Assure optimal development outcomes from proposed investments.**

SCOPING



This phase of the SA defines the information the SA report should provide. It concentrates on relevant impacts and possible alternatives and includes:

1. The environmental objectives and indicators (if any at this stage) that should be considered by the SA

2. The environmental impacts to be considered by the SA including cumulative impacts.

3. A decision on the alternatives to be considered by the SA. Scoping will result in a listing of alternatives that will be considered and assessed by the process.

4. An approach to the assessment (baseline studies and surveys, forecasting, back-casting, scenario building, expert judgement, etc.)

5. A full justification for leaving issues out of the SA that might have been proposed during the scoping phase.

IDENTIFICATION, SELECTION AND ASSESSMENT OF ALTERNATIVES

Stakeholder participants identified four (4) alternative development alternatives, including a "business as usual" or no site development alternative during the Scoping stage of the SA Process. Each alternative was analysed by participants on the basis of expert judgment through scenario construction and forecasting. Preliminary impact and issue analysis was carried out for each of the alternatives proposed.

The Assessment Phase considered the environmental, social, economic and developmental impacts of the proposed industrial estate at the proposed site and an alternate site. The Assessment Phase effectively contributed to:

- The identification of: Natural assets; Risk areas; Development constraints: Planning conflicts; Conflicting resource demands; Predicted resource demand; Predicted urban expansion and investment areas; Demographic trends and settlement patterns, etc. Impacts (point source and cumulative) are identified and analysed (all considered relative to site visits, ancillary studies, interviews, expert inputs and documentary evidence);

- The identification of Sectoral synergies and inconsistencies and led to the identification of options and opportunities;

- The identification of suitable and targeted impact mitigation for each identified development action.

- Recommendations to National and Dzongkhag administrations on the need to introduce outcomes to future planning and development of the Dzongkhags directly and indirectly affected by hydropower development on Basin-2 (including all support infrastructures and expansion areas).

It should be noted that, as a direct result of its participative nature, the assessment stage proved itself as a valuable integration and consensus-building instrument vital to the outcome of the SA process.

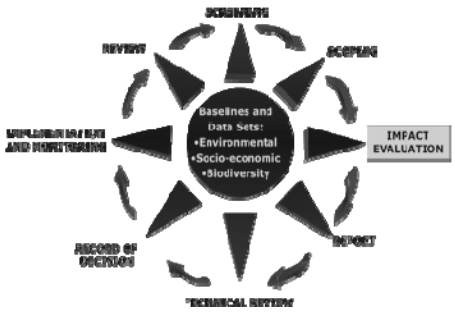
SELECTION OF PREFERRED ALTERNATIVES

Analysis and discussion of the four (4) proposed alternatives permitted participants to evaluate the merits and demerits of each proposed development option. On the basis of this analysis, participants arrived at a consensual decision regarding which alternative(s) would be retained for further detailing and which would be rejected.

The results of this analysis are presented in Section-5 of this Report

The results of the Assessment Phase are complied to prepare this Draft SA Report. The Report is then subjected to a further stakeholder consultation and validation procedure and adjusted as necessary to prepare the Final SA Report.

IMPACT EVALUATION



Impact evaluation normally relies on the availability of suitable data sets and environmental baselines determined for the defined area to be considered in the assessment. In the absence of robust data sets and baselines, the SA can be effectively carried out on the basis of expert judgement, rapid surveys and existing data sets.

The National Environment Commission Secretariat has an environmental and biodiversity baseline for the target area drawn from the Bhutan Environment Outlook (2008), Environmental Impact Assessments carried out for the Punasangchu-1 Hydropower project, and various other documentary sources. The impact assessment of development expected from the Basin-2 hydropower projects and its variants were assessed on the basis of scenario building and impact forecasting relative to a *do nothing-or zero option scenario.* Forecasting was carried out on the basis of expert judgement.

SETTING PLANNING AND DEVELOPMENT PRIORITIES

The detailed outcome of the Strategic Assessment provides opportunities for National and Sub-National administrations to define development and investment priorities structured on a sequential development framework elaborated over a 20-year time frame.

Each identified development action is coherent to the overall development objective and its expected impacts (point source and cumulative) have been mitigated. Regular monitoring throughout their implementation periods will ensure that both mitigation and management are adequate and effective.

Prioritisation and sequencing should be reconsidered at regular intervals through the Review process described below in Item-F of this chapter of the Report.

INTRODUCING GNH MANAGEMENT AND MITIGATION MEASURES

Each identified development action will have direct and indirect social, environmental, economic and “well-being” (GNH) impacts. Taken individually, the impact footprint of each development action would normally be mitigated and managed through EIA regulatory procedures.

In an SA process, the expected/predicted impacts of development actions are considered jointly, over a large geographic area and over a significant period of time (20-years). As such, the process considers direct and indirect point source and cumulative impacts and introduces consequent management and mitigation measures to address these.

The effectiveness of introduced mitigation and management to offset expected/predicted impacts is also monitored at regular intervals through protocols specific to the SA Process and its future cycles.

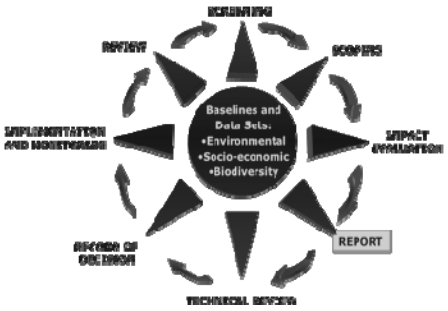
DEVELOPMENT CONDITIONALITY

The outcomes of the SA process provides development, planning and regulatory authorities with the means to define investment and development conditionality for each development/investment type.

Development conditionality serves multiple purposes:

- Provides development authorities and private sector interests with a clearly defined set of conditions that must be included in their proposal, design or activity to ensure that predicted impacts are mitigated and managed prior to any agreement/license to proceed.
- Ensures that incompatible development activities are not located in such a way as to detract value and opportunity from existing or proposed investments (tourism areas are not located adjacent to industrial areas or noxious service facilities such as waste treatment and processing).
- Reduces the need for costly EIA's and, as such, serves as an investment promotion tool.
- Provides guarantees and assurance to investors and ensures that all development proposals or actions are treated in the same manner.
- Conditionality can be applied to an area identified for similar development types.
- Conditionality is an effective mechanism to manage expected cumulative impacts.

B: THE STRATEGIC ASSESSMENT REPORT



The SA Report is written to inform decision-makers on the environmental, social and economic - GNH impacts of the programme, policy, plan or development proposal.

- The Report is the outcome of the process. It is a document intended to inform National, Sectoral and Dzongkhag planning processes and introduce environmental management and mitigation measures.

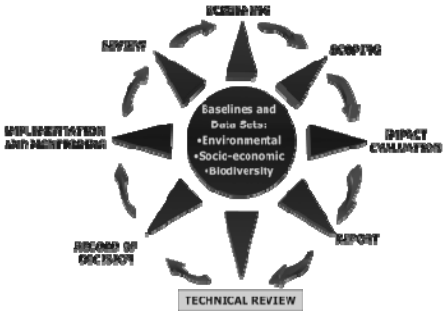
- The SEA Report is a concise document supported by Annexes that presents the findings of the Process and serves to inform National Planning Agencies (GNHC) and relevant Sector Planning bodies on the need to introduce adjustments, mitigation or other relevant recommendations;

- The report informs future planning, programming and decision-making processes targeting the Dzongkhags within the projected area of influence of the proposed development actions.

- The report provides the means to monitor progress against agreed baselines. The Report also describes: monitoring requirements; over what period/frequency monitoring should be carried out; and, who shall be responsible

- The Strategic Assessment Report is a living document that should be revised regularly to ensure that it remains pertinent to the national, regional and local development landscape.

C: TECHNICAL REVIEW



The Technical Review of the SA process and Report is normally carried out by an external neutral body and provides a means for quality assurance of both the report and the process. The review determines whether the Report has addressed the issues raised during the scoping phase and determines and whether all options and alternatives have been fully discussed, forecasts accurately presented and determines whether the level of participation has been adequate. The review process concentrates heavily on the Executive Summary that must accurately reflect the contents of the Report.

In the case of the current Strategic Assessment, the Draft SA Report will be circulated for comment and presented to a National Consultation Workshop for comment and adjustment as required.

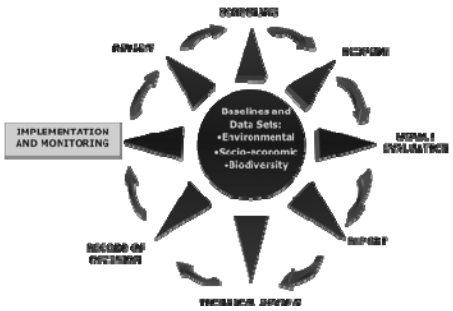
D: ADOPTION, ENDORSEMENT AND RECORD OF DECISION

On completion of the Technical Review, the approved final SA report is submitted to a joint meeting of the National Environment Commission, the Gross National Happiness Commission and the National Land Commission.

On receipt of the Draft SA Report, the Joint Commissions consider: the integrity and completeness of the Report; whether the report represents a balanced and unbiased record of the consensual opinion of Stakeholders; to what extent comments from consultative meetings have been taken into account and introduced to the Report; the relevance of impact management and mitigation measures; coherence with other Plans, Programmes or Strategies and the methods proposed to monitor significant environmental and socio-economic impacts. Comments from the Joint Commissions are introduced to the Report to produce the Final and definitive SA Report. Once finalised, the Commissions approve/accept to formally receive the SA report and their Chairman (the Prime Minister) endorses the document.

Endorsement consists of a document known as the "Record of Decision" that instructs National and Sub-National Administrations to introduce the outcomes to their future planning, informs lower tiers of government on implementation and management modalities; recommends the adoption of development conditionality, establishes impact and performance monitoring procedures and instructs on the means to formalise Process Recommendations.

E: IMPLEMENTATION AND MONITORING

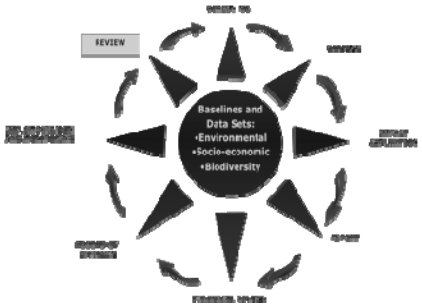


The SA Report has identified development priorities and impact-monitoring modalities to ensure that proposed management and mitigation measures are effective and are implemented systematically. Systematic monitoring will also identify unforeseen impacts and allow the proponent or concerned authorities to introduce appropriate mitigation at an early stage. Monitoring also gauges to what degree process recommendations and outcomes are introduced to planning and management processes at the Provincial, District and Local levels of government.

Section-8 of this Report details monitoring modalities and identifies the relevant National, and Sub-National Authorities that could assume monitoring

responsibilities. Actual monitoring responsibilities should be clearly attributed within the National, Provincial and District Plans (Annual Plan and Five-year Plan).

F: REVIEW



The Review Stage of an SA process is both critical and essential to subsequent planning cycles. It is during the review stage that the principal difference between an EIA and an SA is realised. An EIA is a one-time assessment followed by monitoring to ensure that prescribed mitigation has been introduced and is effective. An SA/SEA is a continuous and cyclic process where results of monitoring are re-introduced to subsequent SA process cycles thereby improving the resolution and effectiveness of the process itself.

The SA Review Stage is carried before the initiating a subsequent cycle (the Process is initiated prior to a 5-year or Annual planning cycle). The Review:

- Contributes effectively to a critical assessment of development priorities identified during the previous SA Process cycle.
- Tests whether the prioritised development action is still relevant and considers its position relative to new actions that may now be required given an evolution in the overall development landscape.
- Test the overall effectiveness of mainstreamed of impact management and mitigation measures;
- Allows for recommendations to be made regarding the introduction of new development actions during the subsequent Process cycle;
- Identifies the need for the introduction of more robust impact management and mitigation.
- Identifies weaknesses in the previous Process cycle and makes recommendations on corrective measures to be introduced to the subsequent cycle.

In conclusion: *The quality and effectiveness of an SEA/SA process improves each time the process cycle is carried out to support and inform a particular planning cycle or inform development planning (the present case).*

12.2 ANNEX-2: MACROZONING OF SELECTED FOCUS AREAS

PURPOSE:

The purpose of macro-zonation of the Area of influence or the focal areas identified by process participants is to describe a physical representation of prospective development expected from their preferred alternative. As such, macrozoning serves to:

- Identify the physical location of development type on a defined territory (area of influence or selected focal area for development) and to fit in adjustments expected from a Plan, Programme or Complex Development Project.

- To assess the compatibility of proposed activities relative to the physical character of the site; adjacent social and economic activities, nature of expected impacts (environmental and socio-economic), the nature of expected cumulative impacts, future development options, infrastructure and proximity to areas with incompatible development or economic activities,

METHODOLOGY:

Within the context of this Strategic Assessment, process participants were asked to consider the likely development impact of hydropower investments on Basin-2 relative to current land use and settlement patterns. They were then requested to project future land use and settlement patterns over the 20-year temporal framework of the assessment and to plot these as broad macro-Zones on the territory likely to be affected.

Broad macrozoning presented in figures 12.2.3 and 12.2.4 below represent the opinion and choice of process participants. The macro-zoning exercise would have to be repeated to introduce greater precision to enable the National Land Commission to introduce results to their National Digital Cadastre.

Macro-zones represent a consensual opinion on optimal use of available land and resources to accommodate forecasted development in any given geographic area.

POLYGON (ZONE) CONDITIONING:

For the purpose if this Strategic Assessment, “Polygon Conditioning” refers to the introduction of development principles and parameters to development Zones identified by process participants and physically located on the territories likely to be affected by hydropower development mega-projects on the Punasangchu River.

Conditioning describes: The type of development expected in each of identified Zones; Acceptable development or investments in each Zone; unacceptable or incompatible development that would be excluded for a Zone; Requisite

development planning; Recommended environmental mitigation and management needs for each Zone to offset possible point source or cumulative impacts and, if required specific compliance monitoring needs.

Conditioning has three principal purposes:

1. I**nforms** Municipal, Dzongkhag and Central planning and development Authorities on territorial planning options and conditions attached to each Zone proposed in the option. Conditioning would then serve to inform coherent territorial planning and ensure that identified environmental mitigation and management measures are systematically introduced (mainstreamed) to all future plans;

2. **Protects** developers and investors against the possibility of incompatible development on adjacent or proximal land (example: an industrial development activity adjacent to a tourism development site);

3. **Promotes** investment and development by: Guiding interested parties to locations compatible to their proposed activity; informing interested parties of development conditionality that must be met prior to approval of any development proposal; introducing transparent and clear procedures for approval of each stage of any development action (concept approval, EIA, conditional license, final approval and license on inspection of completed works).

Development Zones identified by Process Participants are presented and described in the figures below. Figure 12.2.1 is intended to demonstrate how the results and outcomes of a Strategic Assessment process “fits” to the National Digital Cadastre being developed by the National Land Commission and how these will benefit environmental management and monitoring on local, regional and national scales. Figure 12.2.2 Details the salient features of the northern (Wangdue-Punakha) Development Zone likely to be influenced by the development of mega-Hydropower projects on the Punasangchu River. Figure 12.2.3 details macrozoning carried out by process participants for the northern development area. Figure 12.2.4 details macrozoning carried out by process participants for the proposed Lhamoizingka development area.

MANAGING, MONITORING AND MITIGATING DEVELOPMENT IMPACTS

Management and impact mitigation measures attached to each development zone are attached to each plot described on the digital cadastre relative to any identified zone.

Registered plot owners or prospective investors interested in acquiring a plot are provided with documents detailing obligatory conditions that must be met prior to issuance of any license to develop. In the case of existing owners, these are provided

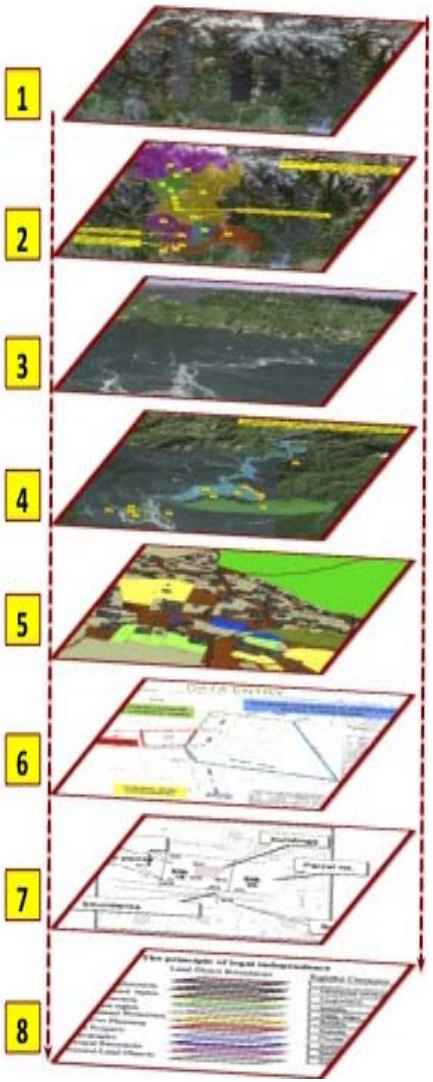
with instructions on how to introduce adjustments to satisfy agreed impact management and mitigation norms.

Once this procedure has been completed, institutions such as the NEC can interrogate any plot on the cadastre and retrieve information detailing the: Name of the owner; Nature of the licensed activity; Expected impacts from the activity; Agreed mitigation measures described in the development EIA; Date the EIA was approved; Agreed reporting schedules; Dates reports were received; Monitoring schedules and outcomes; Details on future monitoring needs which will inform Dzongkhag Environment Officers and NEC monitoring teams; Use of restricted products (fertilizers and pesticides); Nature and volume of wastes generated; Compliance to agreed treatment of generated waste and other information as required by the regulating authority..

Other sectors will also be able to interrogate plots to determine whether sector specific obligations have been met.

Digital Cadastre-based Development Management System.

Figure (12.2.1)



LAYERS	DESCRIPTION
1	The 1st layer would normally be a base map describing a national, regional or local territory to be subjected to a territorial plan. The layer would detail salient geographic features, settlements, natural assets, etc.
2	A 2nd layer could describe the area of influence of a particular development action (mega-project or plan). The layer would include details on administrative boundaries, infrastructure, economic activities, environmental hotspots, national statistical data (settlements, demography, services, etc.) and other information common to all sectors.
3	A 3rd layer could describe the physical, environmental and socio-economic profile of a development focal area likely to be directly affected by the development action. This layer will describe a baseline situation prior to implementation.
4	A 4th layer could describe a territorial organisation of the development focal area. It details development macro-Zones to which is attached development conditionality that detail environmental, structural, architectural and social conditions that must be met by interested parties (the State, Investors and developers). Incompatible activities to any identified development Zone are excluded and directed to an appropriate Zone.
5	Development and conditioned macro-Zones are delivered to the National Land Commission (NLC). The NLC will then prepare a digital cadastre of the macro-Zone including details of: existing properties; current land use; identification and subdivision of plots to be developed; existing infrastructure; planned infrastructure; natural features to be protected; green areas; etc.
6	A 6th layer could describe details of the digital cadastre within an identified macro-Zone. Plot numbers, occupant, use, demarcation points, references, etc.
7	A 7th layer could describe Sector specific information. In the case of NECS it would describe: The licensed activity and details of the license holder; details of the EIA; Nature of Impacts or possible impacts; Reporting schedules; Monitoring schedules; Discharge and emissions criteria; information on solid waste produced; details of any approved reuse and recycling schemes; etc. **This layer of information would significantly focus and improve environmental management capacity (at central and decentralised levels) and serve as an effective means to ensure that mainstreamed management and mitigation measures are appropriate, effective and monitored continuously (*in real time*).**
8	An 8th layer could provide other sectors with the necessary means to manage development actions (detailed in National and Sub-National Development Plans) to verify that mainstreamed mitigation measures are effective and contribute to the delivery of planned development outcomes.

The Cadastre based information system should be centralised and made available to all sectors and levels of government. As such, the system will contribute to: Coordination and coherence amongst all levels and tiers of government; Good governance; Transparency; Future development planning; Environmental management; Monitoring and enforcement.

NORTHERN FOCAL AREA: WANGDUE, PUNAKHA, GASA DEVELOPMENT ZONE (Figure: 12.2.2)

NORTHERN DEVELOPMENT ZONE: DEVELOPMENT MACROZONING (Figure: 12.2.3)

POLYGON (ZONE) CONDITIONING:

1	Pochhu Mixed Agriculture Zone

CONDITIONING:

The zone extends from the confluence of the Pochu and Mochu rivers northwards to the source of the Pochu River. The zone is delineated on both banks of the Pochu River extending laterally along both banks of its tributaries.

- Agricultural areas adjacent to the Pochu River are mapped and inventoried. Plots and title-holders entered to the national digital cadastre.
    - The limits of the zone are plotted on the cadastre. All properties within the zone are subject to comply to the same impact management regulations
    - Updated property titles complete with environmental management conditions are delivered to each registered owner.
    - Available plots and abandoned plots are identified and made available to prospective interested parties.
- A register of fertilizer use in the zone is established.
    - Title-holders keep an updated log of fertilizer use.
- A register of pesticide use in the zone is established.
    - Title-holders keep a log of pesticide use.
- Plot activity and waste profile is entered into an environment layer of the digital cadastre information system.
- Waste management infrastructure (relative to each plot) is entered into the cadastre information system (mains connection, septic tank, pit latrine, solid waste collection, composting, burning, etc)
- Discontinue the use of pit latrines and soak-away pits for domestic sewage
- Define limits to structural development including: height restrictions; architectural style; colour; density; earthquake resistance; proximity to watercourses and GLOF risk areas.

Compatible development:

- Tourism developments;
- Tourism Services (not including laundry services);
- Farm-stay holiday facilities;
- Nature trails;

Incompatible development in this zone:

- Industrial development and manufacturing;
- High-density residential development;
- High-rise structures;
- Sanitary landfill sites;
- Structural developments in GLOF risk areas.

2	Mochu Mixed Agriculture and Tourism Zone

CONDITIONING:

The zone extends from the confluence of the Mochu and Pochu rivers northwards to the source of the Mochu River. The zone is delineated on both banks of the Mochu River extending laterally along both banks of its tributaries.

- Agricultural and Tourism areas adjacent to the Mochu River are mapped and inventoried. Plots and title-holders entered to the national digital cadastre.
    - The limits of the zone are plotted on the cadastre. All properties within the zone are subject to comply to the same impact management regulations
    - Updated property titles complete with environmental management conditions are delivered to each registered owner.
    - Available plots and abandoned plots are identified and made available to prospective interested parties.
- Agricultural areas adjoining the Mochu River are subject to the same conditionality as those described for the Pochu Mixed Agricultural Zone above.
- Tourism developments/investments in the zone are mapped and inventoried. Plots and title-holders are entered into the national digital cadastre.
    - The nature and type of tourism establishment is recorded on the cadastre. This information will include the number of rooms and beds, public facilities (dining rooms, conferencing, recreational services, waste management systems in place, annual occupancy, number of staff, number of vehicles and type of vehicle, energy sources, water sources and others.
    - Plots available for tourism development are identified on the cadastre and made available to prospective investors/developers.
- Formulate tourism development guidelines to include:
    - Density and height of built structures. No structure should exceed two floors.
    - Architectural character of built structures. Structures should be consistent with local/national architectural vocabularies.
    - Standards for internal infrastructures including: waste water treatment; solid waste management; standards for discharged effluents; external lighting; standards for access roads and internal roads;
    - **Spoils disposal**. Spoils generated during construction stages of tourism development shall be disposed of in registered spoils dump areas designated by the proper Dzongkhag or Geog authority. Developers found to be dumping spoils randomly shall be fined and/or made liable for clean-up costs.
    - **Fertilizer and pesticide use**. The use of fertilizers and pesticides shall be regulated as per conditions applied to adjacent agricultural areas and tourism establishments shall maintain a logbook detailing pesticide and fertilizer use.
    - **Waste disposal**. Solid waste shall not be incinerated on site. All solid waste shall be disposed of in municipal waste disposal facilities.
    - **Wastewater treatment**. Distant properties shall be equipped with self-contained compact biological treatment systems (Secondary treatment). Treated water should be used for irrigation purposes. When possible, properties shall be connected to mains sewer lines.
- Privatisation of common property resources such as: riverbanks, watercourses, protective green belts and others shall be prohibited.
- No tourism structures shall be permitted in designated GLOF risk areas.

Compatible Development:

- Farm and home stay facilities;
- Tourism compatible small and medium scale enterprises (restaurants, shops,

handicrafts, adventure sports, bicycle rental, nature trails, guiding services, etc.);
- Expansion of villages and settlements;
- Market gardening

Incompatible Development:
- Heavy and Medium Industries;
- Visible quarries and mines that detract from the scenic character of the area;
- High rise (+4 floors) urban development or urban expansion;
- High density urban development;
- Sanitary landfill sites;

Polluting activities. Any development likely to generate noxious or particulate air emissions or potential noxious wastewater discharges. These could include: industry, manufacturing, brick works, pulp and paper, vehicle maintenance, etc.)

3	Gasa Low Impact Tourism Zone

CONDITIONING:

The low impact tourism zone encompasses Gasa Dzongkhag and northern Punakha Dzongkhag. The zone is integral to the Jigme Dorji National Park (JDNP). As a territory integral to the National Park, its development options are severely curtailed by current Protected Area Management principles and practice. Park management principles also ensure that impacting development cannot be considered.

- All land use types must be recorded, mapped and entered into the national digital cadastre. These include: settlements, cultural sites and values, administrative facilities, monasteries, natural values, trekking routes, campsites and others.
- **Future development options include**:
  - Low Impact Tourism including but not limited to: Farm and home stay holiday accommodation; Lodges and Resorts catering to national and international tourism and in particular the trekking market segments; Serviced campsites; Activity/Adventure tourism products (climbing, white water rafting, hydrospeed, canyoning, canopy walks; Interpreted Nature Trails);
  - Tourism support and guiding services;
  - Market Gardening;
  - Organic farming
  - Expanded production and marketing of certified of non-wood forest products.
  - *A full feasibility study detailing options, opportunities and optimal numbers of development types should be carried out prior to any decision on permissible future development in JDNP.*
- Expansion of potential economic and social development opportunities in designated JDNP territories requires that Park management principles be revised to enable resident populations to benefit from development opportunities available to peoples residing in areas not limited by Park Management principles and objectives. The Nature Conservation Division of the Department of Forests could consider revising Park Zonation to describe development zones and corridors. Areas adjacent to the new road linking Punakha and Gasa town could be considered a development zone. An area defining a development perimeter around Gasa town could also be declassified.

Conditions for development:

- Design criteria detailing structural development must be formulated. Criteria must address: permissible density and height of structures; architectural styles; preferred materials; source of building materials; obligatory waste management regulations; use of toxic or noxious materials.
- All developments must comply with strict EIA regulations imposed on all proposed developments and investments.

Wastewater treatment:

- All tourism facilities shall be required to install state of the art compact biological treatment units of sufficient capacity to treat wastewater generated from all sources (at full occupancy);
- Villages shall be supplied with appropriate treatment facilities and provided with the means to connect all properties to the facility.
- Licenses for construction of individual septic tanks shall be discontinued.
- The use of soak pits and pit latrines shall be discontinued.
- Discharges of raw sewage to any receiving water shall be prohibited and strictly enforced.
- Dzongkhag Environment Officers will establish a regular water-monitoring schedule.

Solid waste management:

- Appropriate facilities shall be made available to Gasa Dzongkhag.
  - Incineration shall not be permitted.
  - All tourism establishments shall practice re-use and recycling. Arrangements must be made to transport sorted material to collection points in Punakha or Wangdue.
  - Dumping of waste oils (all sources) is prohibited. Waste oils must be transferred out of the area to registered collection points.
  - Gasa Dzongkhag should evaluate and select the most appropriate option for the treatment of municipal and consolidated waste (from distant tourism facilities). These could include: Baling systems; Waste reduction, recycling and composting; External treatment.

Spoils management:

- Prepare a spoils management plan. Spoils originating from building, road works, demolition, construction of electrical transmission infrastructure, or any other engineering work shall be disposed of in agreed locations that do not interfere with any natural system. Dumping in micro-valleys, watercourses or liable to slip shall not be prohibited.
  - Spoils re-use and recycling procedures shall be developed and enforced.

Agriculture:

- Agricultural areas in Gasa Dzongkhag are mapped and inventoried. Plots and title-holders entered to the national digital cadastre.
  - The limits of each identified agricultural area is plotted on the cadastre. All properties within any agricultural area is required to comply to the same impact management regulations
  - Updated property titles complete with environmental management conditions are delivered to each registered owner.

- Available plots and abandoned plots are identified and made available to prospective interested parties.

- A register of fertilizer use agricultural areas is established (on a plot by lot basis).
  - Title-holders must keep an updated log of fertilizer use.
- A register of pesticide use agricultural areas is established (on a plot by lot basis).
  - Title-holders must keep a log of pesticide use.
- Plot activity and waste profile is entered into an environment layer of the digital cadastre information system.

4	Punakha Cultural Heritage and Tourism Zone

CONDITIONING:

The zone describes the area adjacent to and in line of sight of Punakha Dzong. The cultural and historical character of the site precludes adjacent development that would detract from its character. As such, any development likely to impact the site would be excluded and redirected to a more appropriate site.

All land use types must be recorded, mapped and entered into the national digital cadastre.

- Install waste collection at all parking areas used by visitors to the Dzong.
- Construct toilet facilities with wastewater holding tanks (if not connected to mains sewers) adjacent to all parking areas used by visitors.
- All structural development shall be designed to standards fully compatible with the architectural style of the Dzong.
- Construction in GLOF risk areas shall be prohibited.
- Commercial facilities (shops, restaurants) in the vicinity of the Dzong shall be subject to site-specific regulations. Regulations shall instruct on:
  - Sign posting: identification of all commercial business shall be discreet and unique to this site. Carved or sand blasted wood signposting of specific dimensions could be considered. Natural wood with painted highlights should be the norm. The standard blue and white sign is not appropriate to this site.
- Punakha Dzongkhag officers should carry out regular visitor surveys to monitor site management effectiveness. Service adjustments should be made regularly if required from results of visitor surveys.

5	Khuruthang New Town and Expansion Zone

CONDITIONING:

The zone comprises the current limits of Khuruthang new Town and an area adjacent to it that has been designated an urban expansion area by process participants. The new town was developed according to agreed town plans. Further expansion of the urban footprint should be subject to the following conditions:

- Development of the urban expansion area should be detailed in a new urban plan.
  - The local population must agree to the proposed urban plan.
  - The plan will detail the: Physical layout of future expansion areas; density, maximum permissible height; infrastructure layout; location of public services; location of public areas and parks; location of recreational areas; areas available for commercial development; and others.
  - All subdivided plots must be recorded, mapped and entered into the national

digital cadastre.
    - The digital cadastre shall be updated as plots are assigned. The cadastre shall record the title holder, type of structure to be constructed, end use of the structure, number of people residing in or using the structure, volumes of waste and type of waste generated, water consumption, source of the water supply to the property, connection to mains sewer or details of other wastewater infrastructure, electrical consumption, type of heating, etc.

Environmental Management:

- **Wastewater** shall be channelled from all properties to a proposed wastewater treatment facility adjacent to Lobesa (see Zone 11 below).
    - Discharge of untreated wastewater to the Punasangchu River is prohibited.
    - The use of septic tanks and soak pits shall be discontinued.
    - Contaminated wastewater (hospital waste, hydrocarbon polluted wastewaters, wastewater polluted by other chemical substances) shall be subject to specific treatment regimes to be elaborated by Dzongkhag officials and approved by the NECS.
    - Waste oils and fuels (from garages and vehicle service facilities) shall be transported to collection points. Source and volume shall be recorded at the collection point and revenues generated through reprocessing distributed (according to volume delivered) to respective sources.
- **Solid Waste/Municipal Waste:** Waste shall be collected and treated in facilities common to Punakha, Khuruthang, Lobesa and Wangdue. Consideration should be given to alternatives to a common sanitary landfill site.
    - Khuruthang Municipality shall introduce obligatory waste sorting, re-use and recycling practices to all households and businesses.
    - The Municipality shall require that all new investments/developments, likely to generate significant volumes of waste, introduce demonstrable waste minimisation practice to their operations.
    - Composting of organic waste could be viable treatment alternative but requires efficient sorting at the source.
    - Discussions should be initiated with central authorities to explore the possibility of transferring municipal solid waste to a central treatment facility. A central treatment facility such as an arc plasma incineration plant could effectively treat waste generated in Punakha, Khuruthang, Lobesa, Wangdue, Thimphu, Paro and Haa. *Arc Plasma incineration does not produce emissions and burn gas can be used to generate electricity to offset costs. The by-product is a vitrified material that can be used as an aggregate in road construction.*
- **Potable water supplies:** water sources for Khuruthang town and its future expansion area shall be mapped and entered into the national digital cadastre. Information in the cadastre shall include: maximum and minimum flow; number of plots supplied by any given source; treatment required (by source); regularly updated water quality data; water quality criteria that should not be exceeded (NECS National Standards for drinking water).
    - NECS, together with the relevant Dzongkhag authorities shall be responsible for regular monitoring and quality checks on drinking waters supplied to Khuruthang residents

- In view of the forecast future expansion of Khuruthang it is advisable to identify and secure additional potable water sources and supplies.

- **Emissions:** emissions shall be regulated through the strict implementation of national regulations and management practice. The National Environment Management Council shall make its staff available to Dzongkhag officers to provide training (as needed) to Dzongkhag and Geog officials
  - Investments and developments likely to generate emissions shall not be permitted in the Khuruthang area unless they demonstrate verifiable emission control mechanism in their project/investment proposal.

Spoils management:

- Prepare a spoils management plan. Spoils originating from building, road works, demolition, construction of electrical transmission infrastructure, or any other engineering work shall be disposed of in agreed locations that do not interfere with any natural system. Dumping in micro-valleys, watercourses or liable to slip shall not be prohibited.
  - Spoils re-use and recycling procedures shall be developed and enforced.

Compatible Developments:

- Tourism services;
- Small and medium scale non-polluting enterprises
- Commerce.

Incompatible Developments:

- Emission generating industrial development;
- Mineral processing;
- Abattoirs.

6	GLOF Risk Zones

CONDITIONING:

- GLOF risk zones identified by the Department of Geology and mines shall be revised and included in the digital cadastre as development exclusion areas.
- Structures present in GLOF risk zones should be relocated (if possible) to safe areas.
- GLOF risk zones can be developed as public parks, green belts and recreational areas (footpaths, cycle trails, picnic areas, etc).
- GLOF warning systems must be introduced and the population instructed on response relative to predicted danger levels.
- Contingency (GLOF response) plans must be prepared by the relevant Dzongkhag administration and made known to both government officials and the population.

7	Conservation and Recreation Zone

CONDITIONING:

The zone designates the Toepi Rongchhu River valley and catchment basin. Process participants have described the area as a development exclusion zone and nature conservation zone. As such, only soft developments should be permitted in the delimited zone. These include:

- Interpreted nature trails;
- Picnic sites equipped with picnic tables, BBQ pits, waste disposal receptacles;
- Parking area;

- Field toilets;
- Fire control and management facilities.

Site management should be responsibility of Lobesa Municipality on behalf of the Nature Conservation Division of the Department of Forests-Ministry of Agriculture.

Zones 8, 9 and 10	**Lobesa Town, Lobesa Urban Expansion Zone and Lobesa Services and Manufacturing Zone**

CONDITIONING:

Implementation of the Punasangchu-1 hydropower project has led to a rapid and unplanned expansion of Lobesa Town. The proposed expansion zone has been described on the assumption that the strategic location of Lobesa (on the main East-West-North and South highways) will continue to drive growth and expansion. It has been forecast that Lobesa will become the business and commercial hub of the Wangdue Punakha conurbation. The proposed expansion zones would be available for residential purposes (Zone 9) and (Zone-10) primarily for commercial and service purposes.

Planning: Lobesa town should be precision mapped. Plots, parcels, commercial entities, religious sites, services, infrastructure layout and others must be entered into the digital cadastre.

- The limits of future urban (9) and commercial/services expansion areas (10) should be identified and plotted on the digital cadastre.
- The expansion area should then be planned and the plan presented to the general public for comment and endorsement.
- Plots can be made available once land within the expansion area has been secured.
    - Alternatively, plot owners within the expansion area can place their properties on the market and receive market value at a time of their choosing.
- The town plan and plan for future expansion areas must detail all physical planning aspects. These would include but not be limited to: Roads; electricity distribution infrastructure; telecommunications infrastructure, individual plots; green areas; commercial use areas (shops, markets, restaurants, hotels and inns, etc); recreational areas; services (schools, hospitals, police stations, etc.); garages and others.
    - The consolidated town plan will also detail environmental management infrastructure. This will include but not be limited to: Water distribution infrastructure; wastewater collection infrastructure; solid waste collection points; solid waste sorting facilities; waste water treatment facility described as Zone 11 below.
    - The plan will detail a zoning plan for the commercial/services expansion zone to ensure that like activities are clustered. Social service facilities must be clustered in an area that is both easily accessible to town residents but also distant from any incompatible activity (noise generating activity would not be placed adjacent to a school or hospital).
    - The consolidated town and expansion area plan will be mainstreamed to embed environmental and socio-economic safeguards designed to mitigate expected impacts.

- The plan will be screened to test the level of mainstreaming by NECS and GNHC.

The digital cadastre shall be updated as plots are assigned. The cadastre shall record the title holder, type of structure to be constructed, end use of the structure, number of people residing in or using the structure, volumes of waste and type of waste generated, water consumption, source of the water supply to the property, connection to mains sewer or details of other wastewater infrastructure, electrical consumption, type of heating, etc.

Environmental management conditionality will be the same as that described for Khuruthang. The purpose is not to introduce management variants, but to try to standardise under the principle that Punakha, Khuruthang, Lobesa, Bajo, and Wangdue will become a conurbation and will be managed/administered under a single Municipal structure.

Environmental Management:

- **Wastewater** shall be channelled from all properties to a proposed wastewater treatment facility adjacent to Lobesa (see Zone 11 below).
  - Discharge of untreated wastewater to the Punasangchu River is prohibited.
  - The use of septic tanks and soak pits shall be discontinued.
  - Contaminated wastewater (hospital waste, hydrocarbon polluted wastewaters, wastewater polluted by other chemical substances) shall be subject to specific treatment regimes to be elaborated by Dzongkhag officials and approved by the NECS.
  - Waste oils and fuels (from garages and vehicle service facilities) shall be transported to collection points. Source and volume shall be recorded at the collection point and revenues generated through reprocessing distributed (according to volume delivered) to respective sources.
  - The quality and character of wastewater generated in the commercial and services zone will be monitored by Municipal Environment Officers, Dzongkhag Environment Officers and by NECS monitoring teams.
  - Provisions for pre-treatment prior to discharge to main sewer lines must be established and enforced during the design approval and licensing process (EIA). NECS will ensure that agreed conditions have been met and are being maintained by the license holder.
- **Solid Waste/Municipal Waste:** Waste shall be collected and treated in facilities common to Punakha, Khuruthang, Lobesa and Wangdue. Consideration should be given to alternatives to a common sanitary landfill site.
  - Lobesa Municipality shall introduce obligatory waste sorting, re-use and recycling practices to all households and businesses.
  - The Municipality shall require that all new investments/developments, likely to generate significant volumes of waste, introduce demonstrable waste minimisation practice to their operations.
  - Composting of organic waste could be viable treatment alternative but requires efficient sorting at the source.
  - Discussions should be initiated with central authorities to explore the possibility of transferring municipal solid waste to a central treatment facility. A central treatment facility such as an arc plasma incineration plant could effectively treat waste generated in Punakha, Khuruthang, Lobesa, Wangdue,

Thimphu, Paro and Haa. *Arc Plasma incineration does not produce emissions and burn gas can be used to generate electricity to offset costs. The by-product is a vitrified material that can be used as an aggregate in road construction.*

Spoils management:

- Prepare a spoils management plan. Spoils originating from building, road works, demolition, construction of electrical transmission infrastructure, or any other engineering work shall be disposed of in agreed locations that do not interfere with any natural system. Dumping in micro-valleys, watercourses or liable to slip shall prohibited.
    - Spoils re-use and recycling procedures shall be developed and enforced.
- **Potable water supplies:** water sources for Lobesa Municipality including its future expansion area shall be mapped and entered into the national digital cadastre. Information in the cadastre shall include: maximum and minimum flow; number of plots supplied by any given source; treatment required (by source); regularly updated water quality data; water quality criteria that should not be exceeded (NECS National Standards for drinking water).
    - NECS, together with the relevant Dzongkhag authorities shall be responsible for regular monitoring and quality checks on drinking waters supplied to Lobesa residents
    - In view of the forecast future expansion of Lobesa it is advisable to identify and secure additional potable water sources and supplies.
- **Emissions:** emissions shall be regulated strictly according to established national standards. The NECS shall make its staff available to Dzongkhag officers to provide training (as needed) to Dzongkhag and Geog officials
    - Investments and developments likely to generate emissions shall not be permitted in the Lobesa area unless they demonstrate verifiable emission control mechanism in their project/investment proposal

Compatible Developments:

- Tourism services;
- Small and medium scale non-polluting enterprises
- Commerce (shops, restaurants, financial services, taxi services, etc)
- Managed market area.
- Bus terminal
- Professional vehicle repair facilities.

Incompatible Developments:

- Emission generating industries;
- Any industry or manufacturing enterprise likely to generate toxic waste and/or dust
- Mineral processing;
- Abattoirs and commercial meat processing facilities.

11	Lobesa Region Wastewater Treatment Facility and Forest

CONDITIONING:

The zone identified for construction of Lobesa, Punakha, Khuruthang, Bajo and Wangdue wastewater treatment facility has been located on apparently vacant land south of the Chimi Lhakhang Monastery. The site has been selected on the principle

that it is of sufficient size to accommodate both a closed biological treatment station and a plantation forest to serve as a final filter for treated effluents.
The facility will receive gravity flows from Lobesa, Khuruthang, Punakha, settlements along the Lobesa to Wangdue highway and the Natural Resources College. Wastewater from Bajo and Wangdue would need to be pumped to the treatment facility.

- The precise location of the treatment facility and its adjacent forest must be plotted on the digital cadastre.
  - Sewer networks must be planned and plotted on the cadastre.
  - Pumping stations will be plotted on the cadastre
  - Plots excluded from the sewerage network must be identified and plotted on the cadastre. The plot will identify the type of wastewater system being used (septic tank, soak pit, pit latrine, or other). Alternative plot specific wastewater treatment will be discontinued as the mains sewerage network expands.
- NECS will participate in station design and process selection.
  - NECS will approve and oversee monitoring of the treatment plant and its effluent.
  - A contingency plan will be elaborated in the event the plant should fail.
  - All discharges of untreated wastewater effluents are prohibited. Discharge events must be reported to NECS.
  - NECS, Dzongkhag Environment Officers and Municipal Environment Officers will design a robust monitoring system complete with fixed (geo-referenced) monitoring stations both upstream and downstream of a point on the Punasangchu River perpendicular to the treatment facility.
- Treated water could be used for irrigation purposes if deemed to be clear of all pathogens and other toxic elements.
  - Treated water cannot be used for drinking purposes unless treated to tertiary levels and tested safe.

12	Monastery and Cultural Heritage Site

CONDITIONING:
Chimi Lhakhang has been built on a hilltop adjacent to the Punasangchu and Toepi Rongchhu Rivers. The base of the hill describes the limits of the Zone.

As a religious, cultural heritage and national heritage site the zone is considered as **a development exclusion zone**.

The Lhakhang shall be serviced by Lobesa Municipality: Solid waste collection and disposal; Connection to the Lobesa wastewater treatment facility.

Compatible development:

- Service facilities to improve and regulate visitor access to the site. All facilities would be located the adjacent mixed agricultural zone at the base of the hill. These could include: Parking areas; toilet facilities; serviced rest area.
  - Toilets shall be connected directly to the Lobesa Waste water treatment facility.

Incompatible development:

- All structural development incompatible with the nature of the religious site;
- Residential areas;
- Commercial developments;
- Industrial developments
- Polluting industries.

13	Armed Forces Relocation Zone

CONDITIONING:

Zone-19 describes the limits of the current armed forces base and training centre. This large zone is now located on prime land that will be required for the future expansion of Wangdue town. As such, it is strongly recommended that an alternate site for the base and training facility be identified, reserved for future use and plotted on the digital cadastre.

As a national security facility, information regarding specific internal development shall not be made available to the national digital cadastre. The cadastre will only detail the external limits of the site and any no-build setback that could be established around its perimeter.

- The armed forces facility will be connected to the mains sewer and the Lobesa wastewater treatment facility.
- Armed forces vehicles will deliver solid wastes to a designated Municipal treatment facility.
- Dangerous materials and time-spent ordnance (shells, munitions, explosives) shall be disposed of according to armed forces regulations in safe conditions.

14	Mixed Agriculture Zones

CONDITIONING

The mixed agriculture zones are located on both the eastern and western banks of the Punasangchu River. The zones are primarily agricultural but also contain villages and individual residential/farm building units.

- Identified Agriculture Zones are critical to the social fabric of the area of influence and are vital to the protection of rural landscapes of vital importance to expansion of a local tourism economy.

All plots, properties or agricultural service enterprises in designated Mixed Agricultural zones must be mapped and fully inventoried. Plots and title-holders entered to the national digital cadastre.

  - The limits of the zone are plotted on the cadastre. All properties within the zone are subject to comply to the same environmental and socio-economic impact management regulations.
  - Updated property titles complete with environmental management conditions are delivered to each registered owner.
  - Available plots and abandoned plots are identified and made available to prospective interested parties.

- Mixed Agricultural zones are subject to the same conditionality as those described for the Pochu Mixed Agricultural Zone (described above).
- Describe a critical area needed for production of rice, cereals and produce for local

consumption. This is the area that cannot be compromised in favour of development.

- Identify measures to combat property speculation that could lead to a reduction in designated mixed agricultural areas.
- Consider introduction of compensatory fiscal instruments to reduce revenue gaps between agriculturalists and other commercial activities.

Compatible Development:

- Tourism: hotels, resorts, restaurants.
- Farm and home stay facilities;
- Tourism compatible small and medium scale enterprises (restaurants, shops, handicrafts, adventure sports, bicycle rental, nature trails, guiding services, etc.);
- Expansion of villages and settlements;
- Market gardening

Incompatible Development:

- Any activity that reduces the area available to agriculture
- Heavy and Medium Industries;
- Visible quarries and mines that detract from the scenic character of the area;
- High rise (+4 floors) urban development or urban expansion;
- High density urban development;
- Sanitary landfill sites;

Polluting activities. Any development likely to generate noxious or particulate air emissions or potential noxious wastewater discharges. These could include: industry, manufacturing, brick works, pulp and paper, vehicle maintenance, etc.)

15	Mixed Commercial and Residential

CONDITIONING:

The mixed commercial and residential zones describe areas that are already settled along the Lobesa to Wangdue highway and existing settled areas in Wangdue Town. The zone includes limited expansion possibilities to accommodate future growth. Conditioning relative to these zones is identical to that described for Lobesa (Zones 8,9 and 10) and reflects a needs to introduce coherent and consistent design, development, management and regulatory frameworks in view of a future where all towns, settlements, commercial activities and services are managed as a unified Municipal structure – The Punakha –Wangdue conurbation.

16	College of Natural Resources

CONDITIONING:

The limits of the plot assigned to the College of Natural Resources must be entered into the digital cadastre together with a detail of all its component structures and infrastructures. The digital cadastre will identify end-use of each building, the number of people it can accommodate, water use, on-site waste water treatment, maximum and minimum volumes and nature of solid waste generated, energy consumption, any use of renewable energy sources, and others.

- The College will be required to connect to the mains sewerage network and discontinue using any on-site treatment systems.
- Additional structural development will be subject to the same regulatory

frameworks as those described for adjacent urban, residential or mixed residential and commercial zones.

17	Tourism Zone

CONDITIONING:

A tourism zone has been delineated on the western banks of the Punasangchu River. The zone is located above GLOF risk areas identified by the Department of Geology and Mines. The zone includes existing tourism properties such as the Dragon Nest Hotel and the Punasangchu Cottages. The zone could accommodate other properties upstream of the Punasangchu Cottages property.

- Tourism developments/investments in the zone are mapped and inventoried. Plots and title-holders are entered into the national digital cadastre.
    - The nature and type of tourism establishment is recorded on the cadastre. This information will include the number of rooms and beds, public facilities (dining rooms, conferencing, recreational services, waste management systems in place, annual occupancy, number of staff, number of vehicles and type of vehicle, energy sources, water sources and others.
    - Plots available for tourism development are identified on the cadastre and made available to prospective investors/developers.
- Formulate tourism development guidelines to include:
    - Density and height of built structures. No structure should exceed two floors.
    - Architectural character of built structures. Structures should be consistent with local/national architectural vocabularies.
    - Standards for internal infrastructures including: waste water treatment; solid waste management; standards for discharged effluents; external lighting; standards for access roads and internal roads;
    - **Spoils disposal**. Spoils generated during construction stages of tourism development shall be disposed of in registered spoils dump areas designated by the proper Dzongkhag or Geog authority. Developers found to be dumping spoils randomly shall be fined and/or made liable for clean-up costs.
    - **Fertilizer and pesticide use**. The use of fertilizers and pesticides shall be regulated as per conditions applied to adjacent agricultural areas and tourism establishments shall maintain a logbook detailing pesticide and fertilizer use.
    - **Waste disposal**. Solid waste shall not be incinerated on site. All solid waste shall be disposed of in municipal waste disposal facilities.
    - **Wastewater treatment**. Distant properties shall be equipped with self-contained compact biological treatment systems (Secondary treatment). Treated water should be used for irrigation purposes. When possible, properties shall be connected to mains sewer lines.
- Privatisation of common property resources such as: riverbanks, watercourses, protective green belts and others shall be prohibited.
- No tourism structures shall be permitted in designated GLOF risk areas.

Compatible Development and Land Use:

- Agricultural activities;
- Low rise, low density residential areas;

- Restaurants;
- Souvenir shops.

Incompatible Development:

- Any type of industry;
- Waste water treatment facility;
- Sanitary landfill;
- Any noise generating activity including amusement parks;
- Garages and other types of vehicle servicing facilities.

18	Bajo, Bajo New Town and Expansion Zones

CONDITIONING:

The Bajo New Town and adjacent expansion zones describe areas that are either already settled on the Eastern banks of the Punasangchu River, are being constructed (Bajo New Town) or are likely to be planned and constructed as demand for housing and commercial units increases over the 20-year temporal framework of the assessment.

Conditioning relative to these zones is identical to that described for Lobesa (Zones 8,9 and 10) and reflects a needs to introduce coherent and consistent design, development, management and regulatory frameworks in view of a future where all towns, settlements, commercial activities and services are managed as a unified Municipal structure – The Punakha –Wangdue conurbation.

- A detailed analysis of potential risks associated to a "worst case" GLOF emergency should be carried out. The study should focus on potential loss of property in Bajo New Town and other riverside properties and facilities.
- A disaster preparedness contingency plan should be elaborated and tested.

19	Military Area. *Proposed Future Wangdue Town Expansion Zone*

CONDITIONING:

Zone 19 describes the current area occupied by the armed forces base and training centre in Wangdue Town. The zone occupies approximately 40.5 hectares of primarily flat or minimal slope land. The zone bisects Wangdue Town and the New Town being constructed on Bajo. Likewise, the military area fragments opportunities to plan infrastructure (roads, underground electrical and telecoms distribution, cable systems and water supply and wastewater collection and pumping facilities.

Process participants analysing future expansion options for Wangdue Town concluded that: The Armed Forces Base and Training Centre would either have to be relocated; or that some of its land would have to made available for Wangdue city's expansion sometime over the 20-year temporal framework of the Assessment.
In either case the following issues would need to be considered during the design and planning stages of the expansion area.

Planning Principles: The site provides a unique opportunity to prepare a Model Town Plan that is both forward looking and effective. The Plan could Plan the area to service the tourism focus of Wangdue. It proximity to the Wangdue Dzong makes the

site ideal for a low-rise residential and hotel area. The site would also contain shops, restaurants and entertainment centres (cinemas, parks, etc.). Sections of the Old town due to be demolished should be retained to give the city a unique historic fabric.

Social and Environmental Management Principles: Site control and management procedures would be identical to those described for the other urban development areas in the future Wangdue-Punakha conurbation (See Zones 5, 8, 9, 10, 17 and 18).

20	Bajo Secondary School, Agricultural College and Vocational Training Institute

CONDITIONING:

The limits of the plots assigned to the Agricultural College, the Bajo Secondary School and the Vocational Training Institute (all located on the Eastern Bank of the Punasangchu River must be entered into the digital cadastre together with a detail of all their component structures and infrastructures. The digital cadastre will identify end-use of each building on each plot or parcel. In addition, the number of people they can accommodate, water use, on-site waste water treatment, maximum and minimum volumes and nature of solid waste generated, energy consumption, any use of renewable energy sources, and others will be recorded for each plot on the digital cadastre.

- The Secondary School and Agricultural College will be required to connect to the mains sewerage network and discontinue using any existing on-site treatment systems.

Additional structural development will be subject to the same regulatory frameworks as those described for adjacent urban, residential or mixed residential and commercial zones.

21	Punasangchu-1 Reservoir Recreation Zone

CONDITIONING:

A reservoir extending from the Punasangchu-1 hydroelectric dam upstream to a forecast location north of the Punasangchu Cottages Resort will be created on completion of the building works. It is expected that the reservoir will be fully established at the time of commissioning.

- The reservoir will reduce winter flow rates (the river will become docile) and provide opportunities for the reservoir to be used for recreational purposes.
- During the monsoon period it is likely that river flow will approximate those experienced at present without the existence of the Dam. As such, during the monsoon period, the reservoir would not be available for water-based recreational activities.

- The reservoir and all related infrastructure should be recorded on the digital cadastre.
  - Maximum and minimum reservoir water levels should be clearly identified in the cadastre.
  - The projected GLOF risk zone should be recorded on the cadastre.
  - A no build setback of at least 100m relative to the GLOF risk zone and line describing the maximum allowable reservoir level must be surveyed and mapped.

Recreational use:

Hydropower and other dammed reservoirs are commonly used for recreational purposes in most countries. Recreation is permitted according to strict rules designed to assure the safety of persons and service providers using the resource.

- A flagged chain will be suspended from bank to bank 1/2metre above the water to describe a point beyond which no activity is permitted. The chain is the closest point any reservoir user can approach the Dam and its infrastructure.
- Safe swimming areas must be identified and delimited using surface floats.
  - Bathing water quality must be tested on a regular basis. Bathing will be prohibited in the event that water quality falls below an agreed standard for bathing waters.
  - Either the Dzongkhag Environment Officer or a designated person from the Ministry of Health should carry out regular monitoring of the quality of bathing waters.
  - Boating within a swimming area must be forbidden.
- During minimal flow periods it will be possible for recreational users to use non-motorised vessels (canoes, pedal boats, sail boats, kayaks, row boats, windsurfs and others)
  - Motorised vessels should be permitted on condition that the operator has passed a full training programme and is licensed to operate a motorised vessel and to carry passengers (family and friends).
  - Operators of commercial motorised vessels would have to pass a different testing procedure permitting them to operate a vessel with passengers (paying guests).
  - In both cases the license is intended to test the operators response in the event of any emergency.
- A response contingency plan should be elaborated to respond effectively in case of oils, fuels or chemical spillage.

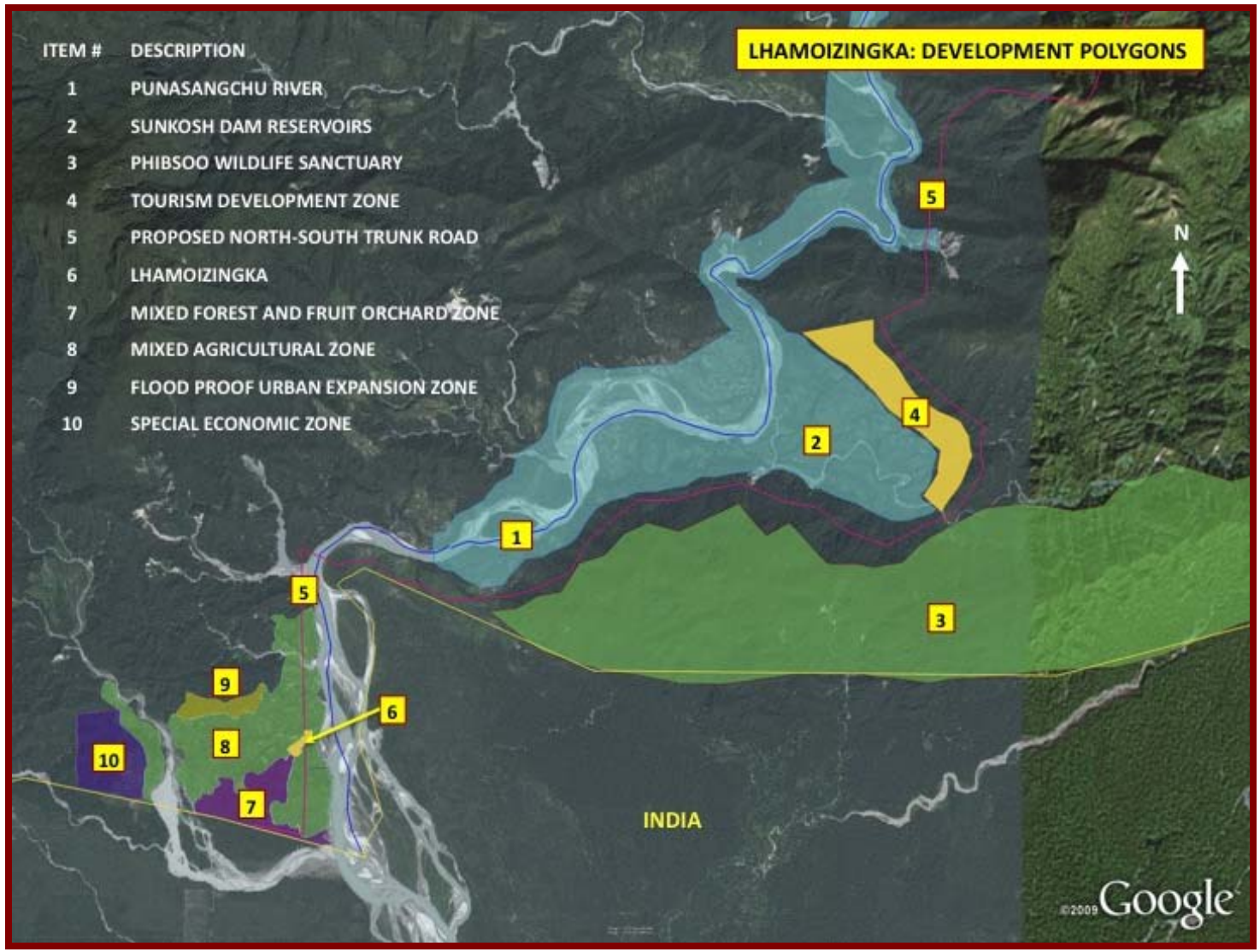
Access Points: access to the reservoir could be from suspended jetties fronting tourism properties, water taxi stops, emergency response facilities and designated swimming areas.

- All access points will have to be agreed by the hydropower authority and Municipal officers responsible for reservoir development and use.
- Activities permitted from each designated access point must be clearly identified on the license.
- Safety measures specific to each access point must be clearly identified on the license.
- The relevant reservoir authority must approve construction techniques and design of any access point.
- Suspended jetties should be the preferred option. A suspended jetty consists of a fixed extremity on shore, a suspended platform and a hinged ramp and floating platform on the reservoir. This arrangement permits the jetty to adjust to the varying water levels of the reservoir. The arrangement also permits the owner to quickly remove the jetty from the reservoir in the event of a flood or extreme flows.

Safety measures: The reservoir authority must recruit and train safety personnel to patrol the reservoir, control its use and rescue vessels or individuals in distress.

Commercial Uses: Commercial users wishing to establish water-taxi businesses could use the reservoir. Other commercial uses could include: Dzong cruises, Water-skiing; Gravel barging services and others. In all cases, commercial use must be compatible with recreational use and must always be controlled and licensed.

SOUTHERN FOCAL AREA: LHAMOIZINGKA DEVELOPMENT ZONE (Figure: 12.2.4)



POLYGON CONDITIONING:

1	Punasangchu River

CONDITIONING:

The Punasangchu River will be altered radically as a result of planned hydropower developments. The proposed Sunkosh Dams will create two reservoirs extending 65 kilometres from a point approximately 14 kilometres from the border with India at Lhamoizingka.

- Changes are likely to result in the loss of existing wetlands, riverbank habitats and existing fish spawning and nursery areas. Changes are expected to be temporary as wetlands, spawning and nursery become re-established in other locations once the reservoirs reach their optimal levels.
- River management plans will have to be adjusted to become reservoir management plans.
- Reservoirs will have to mapped, zoned and all risk areas identified. Risk areas will include but not be limited to: Areas prone to landslides; Surge risk areas to be avoided; Critical habitats; Critical watersheds; and others.
    - A development setback of at least 100m from surge and flood risk areas will be delineated. No structural or infrastructural development should be permitted within the setback.
    - Lands adjacent to the river and at risk from overtopping or breach must be clearly identified (for a worst-case scenario). Development within these areas should be limited to agriculture or other uses that do not require built structures.
- **Fish migration:** The dams are likely to have a significant impact on fish migration. Though dam design does include provisions for the construction of fish ladders, there is no proof that these will be effective. As such, it is likely that the management of fish resources will shift from the management of resident and migrating species to management of resident species within the reservoirs.
- **Spoils dumping:** Spoils dumping into the reservoir basin, micro-valleys and watercourses must be strictly prohibited.
- **Discharges:** All discharges of untreated wastewaters must be strictly prohibited.
- **Monitoring:** The reservoir management body together with NECS and Dzongkhag Environment Officers will be responsible for defining a reservoir-monitoring plan.
    - The plan will identify fixed and geo-referenced monitoring stations.
    - The position of each monitoring station will be entered into the digital cadastre and linked to a publicly accessible database of monitoring results.
    - Monitoring will include species monitoring.
- **Contingency planning in event of oil spills:** Use of the reservoir for commercial and recreation purposes will demand that the reservoir authority together with NECS and Dzongkhag officials elaborate an oil spill contingency plan.

2	Sunkosh Dam and Reservoirs

CONDITIONING:

Two reservoirs would be created (13 and 52 kilometres respectively) if the Sunkosh 4000 and Sunkosh lift dams are constructed. The reservoirs will create significant

water bodies that will significantly alter water current and flow patterns. Issues related to the reservoirs have been described in Zone-1 above. This section will detail additional measures that should be taken into consideration in the preparation of any reservoir use and management plan.

- The reservoirs and all related infrastructure should be recorded on the digital cadastre.
  - Maximum and minimum reservoir water levels should be clearly identified in the cadastre.
  - The projected surge risk and flood risk zones should be recorded on the cadastre.
  - A no build setback of at least 100m relative to the GLOF risk zone and line describing the maximum allowable reservoir level must be surveyed, mapped and entered into the cadastre as a no-development zone.
- The sheer size of the proposed reservoirs will reduce both summer and winter flow rates and provide opportunities for the reservoir to be used for recreational and commercial purposes.

Recreational and Commercial use:

Hydropower and other dammed reservoirs are commonly used for recreational purposes in most countries. Recreation is permitted according to strict rules designed to assure the safety of persons and service providers (commercial users) using the resource.

- A flagged chain will be suspended from bank to bank 1/2metre above the water to describe a point beyond which no activity is permitted. The chain is the closest point any reservoir user can approach the Dams and their infrastructure.
- Safe swimming areas must be identified and delimited using surface floats.
  - Bathing water quality must be tested on a regular basis. Bathing will be prohibited in the event that water quality falls below an agreed standard for bathing waters.
  - Either the Dzongkhag Environment Officer or a designated person from the Ministry of Health should carry out regular monitoring of the quality of bathing waters.
  - Boating within a swimming area must be forbidden.
- Recreational users will be permitted to use non-motorised vessels (canoes, pedal boats, sail boats, kayaks, row boats, windsurfs and others). Users must be required to abide by strict safety regulations.
  - Motorised vessels should be permitted on condition that the operator has passed a full training programme and is licensed to operate a motorised vessel and to carry passengers (family and friends).
  - Operators of commercial motorised vessels would have to pass a different testing procedure permitting them to operate a vessel with passengers (paying guests).
  - In both cases the license is intended to test the operators response in the event of any emergency.
- A response contingency plan should be elaborated to respond effectively in case of oils, fuels or chemical spillage.
- Commercial use shall include but not be limited to: Water taxis, reservoir cruise

boats (overnight accommodation and guest services); Ferry boats; Freight barges; Bulk carriers (aggregates) and others. Commercial use must be compatible with recreational use and must always be controlled and licensed.

Access Points: access to the reservoir could be from suspended jetties fronting tourism properties, water taxi stops, emergency response facilities and designated swimming areas.

- All access points will have to be agreed by the hydropower authority and Municipal officers responsible for reservoir development and use.
- Activities permitted from each designated access point must be clearly identified on the license.
- Safety measures specific to each access point must be clearly identified on the license.
- The relevant reservoir authority must approve construction techniques and design of any access point.
- Suspended jetties should be the preferred option. A suspended jetty consists of a fixed extremity on shore, a suspended platform and a hinged ramp and floating platform on the reservoir. This arrangement permits the jetty to adjust to the varying water levels of the reservoir. The arrangement also permits the owner to quickly remove the jetty from the reservoir in the event of a flood or extreme flows.

Safety measures: The reservoir authority must recruit and train safety personnel to patrol the reservoir, control its use and rescue vessels or individuals in distress.

3	Phibsoo Wildlife Sanctuary

CONDITIONING:

The zone described the current declared limits of the Phibsoo Wildlife Sanctuary. The Nature Conservation Division of the Department of Forests manages and administers the Sanctuary.

- Western limits of Phibsoo WS may need to be adjusted if Sunkosh reservoir levels impinge on its current declared boundaries.
- PWS is a valuable natural asset that will contribute to long-term economic development of the southern focal area.
- Accessible form Lhamoizingka and Sarpang Town
- The Regional airport at Gelephu and the proposed North-South trunk road linking Lhamoizingka to Wangdue, Thimphu and the Eastern Dzongkhags will further enhance access to the site.

Management Needs:

- Prepare a comprehensive living and non-living resource inventories.
- Revise and update inventories, descriptions and physical locations of critical habitats.
- Identify sensitive areas to be avoided by any future infrastructure and visitor access plan.

Support to Local and Regional Economic Development:

- The assessment proposes to define a tourism development zone (Zone 4) in an area adjacent to the Sanctuary. As such, Sanctuary Management Plans should be adjusted to reflect a predicted increase in visitor numbers.

- Access roads, entry gates, a visitor centre, a network of nature trails, wildlife viewing stations, viewing blinds, field toilet facilities and others should be designed and entered into the revised Management Plan.
- Elaborate and implement a waste management plan as and when required.
- Anti-poaching units will need to be reinforced and trained.
- Sanctuary management personnel and anti-poaching units must be supported by adequate equipment inventories.
- The regulatory frameworks will need to be revised.
- Elaborate a benefit sharing strategy and plan through participatory processes involving local populations.

4	Tourism Development Zone

CONDITIONING: A tourism zone has been delineated East of the present Punasangchu River and North of the Phibsoo Wildlife Sanctuary. The Zone is on elevated land and will be fronted by the Sunkosh reservoir once the Sunkosh 4000 and Sunkosh Lift Dams have been constructed. The site has the potential to become Bhutan's premier tourism destination built on its unique mix of water-based tourism, nature-based tourism, proximity to cultural heritage sites and proximity to efficient air and road transport infrastructures. The proposed site is flood proof and its configuration makes it safe from landslide induced reservoir surge.

Immediate needs:

- The proposed site should be delineated and secured for future development once constructions of the proposed Sunkosh Dams have been approved. The delineated site and proposed end-use must be entered into the digital cadastre.
    - The site is subdivided into large development plots. Plots are registered in the cadastre.
    - Development principles are formulated.
    - Marketing material is prepared and made available to prospective investors. Marketing material makes reference to development conditionality elaborated from the items detailed below.

Development conditionality: The unique nature of this site must be protected through a rigid adherence to development standards designed to protect prospective investors from ad-hoc and inappropriate development.

- The area should open to investors willing to develop substantial properties aimed at providing a unique nature based tourism product.
    - Properties will be aimed at high-end market segments and will focus on health, wellness, wildlife and biodiversity, water-based activity experiences, cultural tourism.
    - The properties will all be low-rise and low density.
    - The architectural character of built structures should be unique to the site Buildings should reflect the national architectural style but this should be adjusted to a humid forest environment.
    - All structures will have to employ the best available technologies to minimise impacts, increase environmental efficiency and maximise visitor comfort/safety.
    - All structures must be certified earthquake resistant. Proximity of the site to the Indian Plate subduction zone coupled to the inherent risk from reservoir induced earthquakes obliges investors to design and construct to the strictest

standards.

- The largest structure on any plot will be the common facilities (reception, services, restaurants, kitchens and stores).
- All properties will be permitted to construct private access to the Sunkosh Reservoir. This will include, jetties, boat ramps, artificial beaches, boat moorings, fuelling station and others. Access points will be approved and licensed by the relevant authorities and the reservoir management body.

As Site Development is Initiated: Tourism developments/investments in the zone are mapped and inventoried. Plots and title-holders are entered into the national digital cadastre.

- The nature and type of tourism establishment is recorded on the cadastre. This information will include the number of rooms and beds, public facilities (dining rooms, conferencing, recreational services, waste management systems in place, annual occupancy, number of staff, number and type of boats, number and type of vehicles, energy sources, water sources and others.
- Standards for internal infrastructures including: waste water treatment; solid waste management; standards for discharged effluents; external lighting; standards for access roads and internal roads;
- **Spoils disposal**. Spoils generated during construction stages of each tourism development shall be disposed of on site. Disposal shall include re-use and recycling, landscaping, contouring, and other non-intrusive options. Disposal that damages or threatens natural systems should be prohibited.
- **Fertilizer and pesticide use**. The use of fertilizers and pesticides shall be regulated as per conditions applied to agricultural areas. Each tourism establishment shall maintain a logbook detailing pesticide and fertilizer use.
- **Waste disposal**. Solid waste shall not be incinerated on site. All solid waste shall be disposed of in municipal waste disposal facilities in Lhamoizingka.

- **Wastewater treatment**. Each property shall be equipped with a self-contained compact biological treatment system (Secondary treatment). Treated water should be used for irrigation purposes.
- No tourism structures shall be permitted in designated flood, surge or landslide risk areas.

Compatible Development and Land Use:

- Market gardens
- Low rise, low density residential areas (staff housing colonies);

Incompatible Development:

- Any type of industry or commercial activity adjacent to the designated area;
- Garages and service facilities (adjacent trunk road)
- Noise generating developments.

5	Proposed North-South Trunk Road

CONDITIONING:

A new north-south trunk road connecting Lhamoizingkha to Wangdue via Sunkosh bridge has been proposed by Process Participants. The proposed road would track northwards along the Eastern bank of the Sunkosh reservoirs at a safe distance from all possible flood and surge risks.

The proposed trunk road replaces the planned Lhamoizingka to Daga road. The Planned road would eventually be declassified from a Highway to a Feeder road.
The proposed road would also service the tourism area proposed as zone-4.
Road construction must be carried out to best environmental standards. Spoils shall be re-used as ballast for road construction or transported away from road construction sites.
NECS and Dzongkhag Officials will collaborate with the Roads Department to design the most appropriate safeguard measures to minimise impacts due to road construction.
The proposed road will be subject to an EIA that will also describe social and environmental impact mitigation measures as well management and response procedures once the road has been commissioned.

6	Lhamoizingka Town

CONDITIONING:

Zone-6 describes the current footprint of Lhamoizingka Town. Recent information (available following completion of Process workshop-2) suggests that the Ministry of Home Affairs is currently assessing territorial options available for construction of a New Town. As such, it is suggested that environmental management procedures for the existing Town be upgraded as needed to effectively service its resident population. Service improvement should focus on solid waste management, protection of potable water supplies, register and management of fertilizers and pesticides in adjacent agricultural areas and green areas within the town and an inventory of all current sources of pollution that could be mitigated through enhanced management and control measures.

7	Mixed Forest and Fruit Orchard Zone

CONDITIONING:

The limits of the area should be entered into the digital cadastre.
All existing plots must be entered into the cadastre and plot titles should be revised and updated as necessary.
The cadastre should register how the plot is being used, Volume and type of waste generated, on site waste treatment type, size and location of any structures on the plot and others.

- The mixed forest and orchard zone should be treated in a manner similar to mixed agricultural zones (Zone-8 below).
- Forested areas should be managed to preserve forest cover while permitting licensed harvesting to support local wood-based small-scale industries.
- Local inhabitants could use Forest litter and fallen trees as fuel wood.

Compatible development:
Market gardening and certified organic fruit and produce.
Small-scale value addition wood industries.
Incompatible development:
Any type of emission and waste generating processing industry.
Sanitary landfill.

8	Mixed Agricultural Zone

CONDITIONING:

The mixed agriculture zones are located adjacent to Lhamoizingkha in an area bounded by the Thimphu River to the West and Punasangchu River to the East. A second area is located north of the proposed Special Economic Zone and Industrial/Manufacturing Area on the western bank of the Thimphu River. The zones are primarily agricultural but also contain settlements and individual residential/farm building units.

- Identified Agriculture Zones are critical to the social fabric of the area of influence and are vital to the protection of rural landscapes of vital importance to expansion of a local tourism economy.

All plots, properties or agricultural service enterprises in designated Mixed Agricultural zones must be mapped and fully inventoried. Plots and title-holders entered to the national digital cadastre.

  - The limits of the zone are plotted on the cadastre. All properties within the zone are subject to comply to the same environmental and socio-economic impact management regulations.
  - Updated property titles complete with environmental management conditions are delivered to each registered owner.
  - Available plots and abandoned plots are identified and made available to prospective interested parties.

- A register of fertilizer use in the zone is established.
  - Title-holders keep an updated log of fertilizer use.
- A register of pesticide use in the zone is established.
  - Title-holders keep a log of pesticide use.
- Plot activity and waste profile is entered into an environment layer of the digital cadastre information system.
- Waste management infrastructure (relative to each plot) is entered into the cadastre information system (mains connection, septic tank, pit latrine, solid waste collection, composting, burning, etc)
- Discontinue the use of pit latrines and soak-away pits for domestic sewage
- Define limits to structural development including: height restrictions; architectural style; colour; density; earthquake resistance; proximity to watercourses and GLOF risk areas.
- Describe a critical area needed for production of rice, cereals and produce for local consumption. This is the area that cannot be compromised in favour of development.
  - Identify measures to combat property speculation that could lead to a reduction in designated mixed agricultural areas.
  - Consider introduction of compensatory fiscal instruments to reduce revenue gaps between agriculturalists and other commercial activities.

Compatible Development:

- Tourism: hotels, resorts, restaurants.
- Farm and home stay facilities;
- Tourism compatible small and medium scale enterprises (restaurants, shops, handicrafts, adventure sports, bicycle rental, nature trails, guiding services, etc.);
- Expansion of villages and settlements;
- Market gardening

Incompatible Development:

- Any activity that reduces the area available to agriculture
- Heavy and Medium Industries;
- Visible quarries and mines that detract from the scenic character of the area;
- High rise (+4 floors) urban development or urban expansion;
- High density urban development;
- Sanitary landfill sites;

  Polluting activities. Any development likely to generate noxious or particulate air emissions or potential noxious wastewater discharges. These could include: industry, manufacturing, brick works, pulp and paper, vehicle maintenance, etc.)

9	Lhamoizingka Flood Proof Urban Expansion Zone

CONDITIONING:

The Government of Bhutan, Dagana Dzongkhag Officials and local inhabitants are currently considering possible locations for the New Lhamoizingka town. Several options close to the border with India have been considered.

The Prospective Strategic Assessment considered possible locations for a New Lhamoizingka Town. Sites were analysed relative to: The proposed location of future transport infrastructures; Locations of bridges across the Thimphu River and the Punasangchu River. In addition, the analysis considered the target area relative to flood risk due to a major GLOF event, or to a catastrophic failure of the Sunkosh 4000 or Sunkosh Lift dams.

The proposed site has been selected on the basis that it provides effective flood proofing against all flood events noted above. The site is elevated and is provided protection by undeveloped areas that will tend to deflect floodwaters to the south and east.

Relevant authorities should critically evaluate the proposed site.

Management and mitigation measures that should be taken into account when preparing a design and development Plan for New Lhamoizingka Town include but are not limited to:

Planning: Lhamoizingka New Town should be precision mapped within the area designated for its different stages of development. Plots, parcels, commercial areas, religious sites, services, parks and recreation areas, infrastructure layout and others should be clearly identified and entered into the digital cadastre.

- The limits of future residential, commercial/services areas should be identified and plotted on the digital cadastre.
- Residential areas should be separated from commercial and services areas by green areas or parks.
- Urban development plans should be presented to the general public for comment and endorsement.
- Plots can be made available once land within the development area has been secured.
  - Private land should be converted to the use specified by the Plan for any given location. Owners should be provided with the opportunity to retain and subdivide their land according to the proposed plan. Properties should be valued and sold in an open and transparent market.
  - The New Lhamoizingka Town plan should detail environmental management

infrastructure. This will include but not be limited to: Water distribution infrastructure; wastewater collection infrastructure; solid waste collection points; solid waste sorting facilities;

- The plan will detail a zoning plan for commercial and service enterprises to ensure that like activities are clustered. Social service facilities must be clustered in areas that are both easily accessible to town residents but also distant from any incompatible activity (noise generating activity would not be placed adjacent to a school or hospital).
- The New Lhamoizingka town will be mainstreamed to embed environmental and socio-economic safeguards designed to mitigate expected impacts.
- The plan will be screened to test the level of mainstreaming by NECS and GNHC.

The digital cadastre shall be updated as plots are assigned. The cadastre shall record the title holder, type of structure to be constructed, end use of the structure, number of people residing in or using the structure, volumes of waste and type of waste generated, water consumption, source of the water supply to the property, connection to mains sewer or details of other wastewater infrastructure, electrical consumption, type of heating, etc.

Environmental management conditionality will be the same as that described for other Towns in the area of influence (Khuruthang, Lobesa, Wangdue, Punakha and Bajo). The purpose is not to introduce management variants, but to try to standardise Municipal environmental management. It is evident that each city or Town will have specific needs according to the physical character of its surroundings and the nature of its economic activities. But, in general, the principles presented below are sound and should be treated as standard requirements of future urban development.

Environmental Management:

- **Wastewater** shall be channelled from all properties to a wastewater treatment facility adjacent to Lhamoizingka New Town.
  - Discharge of untreated wastewater into the Punasangchu River, the Thimphu River or any other watercourse must be strictly prohibited.
  - The use of septic tanks and soak pits should be discontinued.
  - Contaminated wastewater (hospital waste, hydrocarbon polluted wastewaters, wastewater polluted by other chemical substances) shall be subject to specific treatment regimes to be elaborated by Dzongkhag officials and approved by the NECS.
  - Waste oils and fuels (from garages and vehicle service facilities) shall be transported to collection points. Source and volume shall be recorded at the collection point and revenues generated through reprocessing distributed (according to volume delivered) to respective sources.
  - The quality and character of wastewater generated in the commercial and services zone will be monitored by Municipal Environment Officers, Dzongkhag Environment Officers and by NECS monitoring teams.
  - Provisions for pre-treatment prior to discharge to main sewer lines must be established and enforced during the design approval and licensing process (EIA). NECS will ensure that agreed conditions have been met and are being

maintained by the license holder.

- **Solid Waste/Municipal Waste:** Waste shall be collected and treated in facilities common to all settlements. Villages and towns in the vicinity of New Lhamoizingka Town. Consideration should be given to alternatives that would replace sanitary landfill sites.
    - Lhamoizingka Municipality shall introduce obligatory waste sorting, re-use and recycling practices to all households and businesses.
    - The Municipality shall require that all new investments/developments, likely to generate significant volumes of waste, introduce demonstrable waste minimisation practice to their operations.
    - Composting of organic waste could be viable treatment alternative but requires efficient sorting at the source.

Spoils management:

- Prepare a spoils management plan. Spoils originating from building, road works, demolition, construction of electrical transmission infrastructure, or any other engineering work shall be disposed of in agreed locations that do not interfere with any natural system. Dumping in micro-valleys, watercourses or liable to slip shall prohibited.
    - Spoils re-use and recycling procedures shall be developed and enforced.
- **Potable water supplies:** water sources for Lhamoizingka New Town and adjacent settlements should be mapped and entered into the national digital cadastre. Information in the cadastre should include: maximum and minimum flow; number of plots supplied by any given source; treatment required (by source); regularly updated water quality data; water quality criteria that should not be exceeded (NECS National Standards for drinking water).
    - NECS, together with the relevant Dzongkhag authorities shall be responsible for regular monitoring and quality checks on drinking waters supplied to Lhamoizingka residents
- **Emissions:** emissions shall be regulated strictly according to established national standards. The NECS shall make its staff available to Dzongkhag officers to provide training (as needed) to Dzongkhag and Geog officials
    - Investments and developments likely to generate emissions shall not be permitted in the Lhamoizingka urban zone unless they demonstrate verifiable and effective emission control mechanisms in their project/investment proposal

Compatible Developments:

- Tourism services;
- Small and medium scale non-polluting enterprises
- Commerce (shops, restaurants, financial services, taxi services, etc)
- Managed market area.
- Bus terminal
- Future railway station
- Professional vehicle repair facilities.

Incompatible Developments:

- Emission generating industries;
- Any industry or manufacturing enterprise likely to generate toxic waste and/or dust

- Mineral processing;
- Abattoirs and commercial meat processing facilities.

10	Special Economic Zone and Manufacturing Area

CONDITIONING:

An area destined for development as a Special Economic Zone (SEZ) focussed on industry and manufacturing businesses has been located on the Western Bank of Thimphu River adjacent to the international border with India.

The area is slightly elevated and apparently protected from extreme flooding events.

As an SEZ the site would be treated as a semi-autonomous economic development entity subjected to a tailored fiscal structure and free of customs and import duties (when exporting its products outside the national territory of Bhutan.

The Lhamoizingka SEZ would be part of a series of such entities established at strategic border locations in southern Bhutan.

Development Planning: Site boundaries would be surveyed, mapped and entered into the digital cadastre.

The site should then be subdivided and each plot entered into the cadastre together with infrastructure plans (roads, electrical distribution, water supplies, wastewater collection; on-site waste water treatment facilities; telecommunication distribution network; green areas; administration block and zones for specific industry types, services and others.

Environmental Management:

- **Wastewater** shall be channelled from all properties to a proposed (on-site) wastewater treatment facility.
- Discharge of untreated wastewater to the Thimphu River or any other watercourse must be strictly prohibited.
- The use of septic tanks and soak pits shall not be allowed under any circumstance. This exclusion also applies during construction phases (contractors will have to install temporary biological treatment systems)
- Contaminated wastewater (hydrocarbon polluted wastewaters, wastewater polluted by other chemical substances or heavy metals) shall be pre-treated by the generating industry to standards acceptable for introduction to normal wastewater streams and treatment. Provisions for pre-treatment prior to discharge to main sewer lines must be established and enforced during the design approval and licensing process (EIA). NECS will ensure that agreed conditions have been met and are being maintained by the license holder. The NECS will monitor compliance.
- Waste oils and fuels (from garages and vehicle service facilities) shall be transported to collection points/transfer stations. Source and volume shall be recorded at the collection point and revenues generated through reprocessing distributed (according to volume delivered) to respective sources.
- The quality and character of wastewater generated in industrial, commercial and services zone will be monitored by Municipal Environment Officers, Dzongkhag Environment Officers and by NECS monitoring teams.

- **Solid Waste/Municipal Waste:** Waste shall be collected and treated in facilities

servicing Lhamoizingka New Town and adjacent settlements. Consideration should be given to alternatives to a common sanitary landfill site.

- The SEZ administration shall introduce obligatory waste sorting, re-use and recycling practices to all investors. This requirement shall be included in each license/contract.
- The SEZ administration shall require that all new investments/developments, likely to generate significant volumes of waste, introduce demonstrable waste minimisation practice to their operations.

Spoils management:

- The SEZ administration together with Dzongkhag and NECS Officials shall prepare a spoils management plan. Spoils originating from building, road works, demolition, construction of electrical transmission infrastructure, or any other engineering work shall be disposed of in agreed locations that do not interfere with any natural system. Dumping in micro-valleys, watercourses or any landslide prone area shall prohibited.
  - Spoils re-use and recycling procedures shall be developed and enforced.
- **Water supplies:** Water sources available to the SEZ shall be identified, mapped and entered into the national digital cadastre. Information in the cadastre shall include: maximum and minimum flow; number of plots supplied by any given source; treatment required (by source); regularly updated water quality data; water quality criteria that should not be exceeded (NECS National Standards for drinking water).
  - NECS, together with the relevant Dzongkhag authorities shall be responsible for regular monitoring and quality checks on waters supplied for human consumption or for use in a food processing industry.
- **Emissions:** emissions shall be strictly regulated according to established national standards. The NECS shall make its staff available to Dzongkhag officers to provide training (as needed) to Dzongkhag and Geog officials
  - Investments and developments likely to generate emissions shall be permitted only if they demonstrate verifiable emission control mechanism in their project/investment proposal

12.3 ANNEX-3: LEGAL FRAMEWORK SUPPORTING THE STRATEGIC ASSESSMENT

The Strategic Assessment carried out to determine the wider development impacts expected from the establishment of an Industrial Estate at Dhamdum and a proposed model Industrial Development in the Sibsoo area is founded on the Constitution and Laws of the Kingdom of Bhutan, commitments related to International Conventions to which Bhutan has acceded and Sectoral Acts and Regulations.

The principal legal instruments are described below.

The Constitution of the Kingdom of Bhutan

The Constitution of the Kingdom of Bhutan, which was formally adopted in July 2008, features environmental conservation as a constitutional mandate. Article 5 of the Constitution stresses that:

> ***"Every Bhutanese is a trustee of the Kingdom's natural resources and environment for the benefit of the present and future generations and it is the fundamental duty of every citizen to contribute to the protection of the natural environment, conservation of the rich biodiversity of Bhutan and prevention of all forms of ecological degradation including noise, visual and physical pollution through the adoption and support of environment friendly practices and policies."***

The Article mandates the government to protect, conserve and improve the pristine environment and safeguard the biodiversity of the country; prevent pollution and ecological degradation; secure ecologically balanced sustainable development; and ensure a safe and healthy environment. It further stipulates that the government shall maintain at least 60 percent of the country under forest cover for all time and the Parliament may enact environmental legislation to ensure sustainable use of natural resources, intergenerational equity and the sovereignty of the State over its own biological resources.

Article 22 of the Constitution is dedicated to Local Governments. The first and fourth paragraphs of this Article state the following visionary, clear and supportive statements on Local Governments:

> ***"Power and authority shall be decentralized and devolved to elected Local Governments to facilitate the direct participation of the people in the development and management of their own social, economic and environmental well being.***

The objectives of Local Government shall be to: (a) provide democratic and accountable government for local communities; (b) ensure the provision of services to communities in a sustainable manner; (c) encourage the involvement of communities and community organizations in matters of local governance; and (d) discharge any other responsibilities as maybe prescribed by law made by Parliament."

With regards to local level capacity, the Article stipulates that local governments shall be supported by the central government in the development of administrative, technical and managerial capacities and structures, which are responsive, transparent, and accountable (Section 18a).

Bhutan 2020:

The Bhutanese development philosophy of 'Gross National Happiness' advocates a multi-dimensional development approach that seeks to maintain harmony and balance between economic, emotional and environmental well-being of the people and nation. Bhutan 2020, the country's vision document to maximize GNH, outlines human development, cultural preservation, balanced and equitable economic development, good governance, and environmental sustainability as the main development objectives. These objectives are elucidated with considerable foresight in the following Bhutan 2020 statements:

"(Happiness) is to be achieved within the framework of traditional values and ethics, and through concerted efforts to achieve sustainable improvements in the standard of living, the quality of life, and levels of well-being and welfare.

Future development that not only recognizes, promotes and instils an appreciation and awareness of the nation's rich cultural heritage and its continued value as a rich fund of social philosophy, but also its role in meeting spiritual and emotional needs, in maintaining our distinctive identity, and in cushioning us from some of the negative impacts of modernization.

The benefits of development are (to be) shared equitably between different income groups and regions and in ways that promote social harmony, stability and unity and contribute to the development of a just and compassionate society.

Development of our institutions, human resources and systems in ways that enable us to reduce our dependence on others, to manage an increasingly complex process of development, and to enlarge opportunities for people at all levels to participate more fully and effectively in decisions that have a bearing on their lives and livelihoods and the future of their families, communities and the nation.

The (development) choices made in response to the many challenges that confront the nation embody the principle of environmental sustainability and

do not impair the biological productivity and diversity of the natural environment."

Tenth Five-Year Plan (2008-2012):

The Tenth Five Year Plan (FYP) provides the development framework for the financial years 2008/09 to 2012/13. The central objective of the Tenth FYP is poverty reduction, with the emphasis to reduce the proportion of the population living below the national poverty line from 23.1 percent to about 15 percent. The Tenth FYP can be viewed as Bhutan's poverty reduction strategy. It stresses pro-poor social and economic development approaches such as expanding infrastructure and road connectivity in rural areas where majority of the country's poor live, and strengthening of agricultural production and productivity that will help raise rural incomes and improve food security.

Six key strategies have been identified to achieve poverty reduction in the Tenth FYP. These are: (1) vitalizing industry; (2) national spatial planning (including sustainable urban development and housing); (3) synergizing integrated rural-urban development; (4) expanding strategic infrastructure; (5) investing in human capital; and (6) fostering an enabling environment through good governance.

The Tenth FYP addresses environment as a crosscutting theme. It recognizes that protecting and conserving the environment will require greater attention than before as the accelerating pace of socio-economic development accompanied by increased infrastructure development, urbanization, industrialization, and consumption patterns is expected to create additional stress on the natural environment. At the same time, it emphasizes the need to use the country's environmental resources as a development asset for economic growth and poverty reduction within the limits of sustainability.

The Tenth FYP identifies clear national development and investment priorities. Within these, the document identifies both hydropower development on the Punasangchu River Basin and the development of an Industrial Estate at Dhamdum, Samtse Dzongkhag, as priorities to be either initiated or completed during the period of the Tenth Plan.

Bhutanese laws that provide for environmental management:

There are several laws in the country that provide for environmental management. The key ones are outlined below:

National Environment Protection Act 2007: The Act is an umbrella law, which requires all other laws and regulations governing the use of land, water, forests, minerals and other natural resources to be consistent with it. It specifically lays down principles and directives for the protection of environmental quality and the maintenance of forest, biodiversity and ecosystem integrity.

Environmental Assessment Act 2000: The Act establishes procedures for the assessment of potential effects of strategic plans, policies, programmes, and projects on the environment, and for the determination of policies and measures to reduce potential adverse effects and promote environmental benefits. The Act requires the Royal Government of Bhutan to ensure that environmental concerns are fully taken into account when formulating, renewing, modifying and implementing any policy, plan or programme.

Regulation Environment Impact Assessment and Strategic Environmental Assessment: The Regulation, issued by the National Environment Commission, details the responsibilities and procedures for implementation of Environmental Assessment and clearance procedures of projects as required by the National Environmental Protection Act of 2000.

The Regulation also refers to the need to introduce Strategic Environmental Assessment procedures to ensure that the environmental and social impacts expected from Plans, Policies and Programmes are considered and mitigated prior to finalisation of the PPP formulation process. The regulation furthermore instructs that the SEA process shall be a participatory and consultative process.

Guidelines for Mainstreaming Environment in Policies and Programmes: The National Environment Commission and Gross National Happiness Commission have produced an interim set of "Guidelines for Mainstreaming Environment in Policies and Programmes". The Draft Guidelines have been distributed for comment to all relevant stakeholders and will now be consolidated to similar guidelines aimed at mainstreaming environment for pro-poor growth and development in Policies, Strategies and Plans of the Government of Bhutan.

The consolidated guidance document has not yet been prepared. It is foreseen that the current Strategic Assessment Process detailed in this Report will contribute significantly to the consolidated guidance document.

Furthermore, it is envisaged that the process outcome of this Report and the consolidated guidance document will be integral to the Guidance documents delivered to Local Government as part of the National Decentralisation Process.

Forest and Nature Conservation Act 1995: This law provides for the protection and sustainable use of forests, wildlife and related natural resources of Bhutan, and covers sustainable forest management, protection of government reserved forests, social and community forestry, transport and trade of forestry produce, protected areas, wildlife conservation, soil and water conservation, and forest fire prevention.

Mines and Mineral Management Act 1995: This Act recognizes the preservation, protection and setting of environmental standards and conservation of natural resources as critical for sustainable mining practices, and stipulates various procedures and requirements to ensure that mining projects are planned and carried out with full consideration of environmental management needs.

Pesticides Act 2000: This legislation was enacted with the objective to ensure that integrated pest management is pursued, thereby limiting the use of pesticides as a last resort; assuring that appropriate types and quality of pesticides are introduced into the country; and that pesticides are effective when used as recommended whilst deleterious effects on human beings and the environment are minimized.

Biodiversity Act of Bhutan 2003: This law asserts the sovereignty of the country over its biodiversity resources and lays down the conditions for the grant of access to biodiversity resources, benefit sharing, and protection, and describes various rights, offences and penalties related to biodiversity use.

Road Act 2004*:* The Act accords the Department of Roads the mandate to adopt and promote environment friendly practices and techniques in the implementation of road activities. It requires that all road construction and maintenance works conform to environmental considerations, geological stability considerations and preservation of agricultural land.

Waste Prevention and Management Act 2009: This is the most recent environmental law ratified by the Parliament. The purpose of the Act is to protect and sustain human health through protection of the environment by reducing the generation of waste, promoting the segregation, reuse and recycling of wastes, disposal of waste in an environmentally sound manner, and effective functioning and coordination among implementing agencies.

The Water Act (draft 2009): The Act is currently under final revision. The purpose of the Act is to ensure that water resources are protected, used, developed, conserved and managed in an economically efficient, socially equitable, and environmentally sustainable manner.

Local Governments' Act of the Kingdom of Bhutan, 2009 (LG Act)

The LG Act is anticipated to become effective during the second half of 2009 and will thus provide the overall legal framework for local governance to which SESP and PEI Phase 2 will be aligned. Local government elections are planned to take place during the fourth quarter of 2009 – resulting in elected councils being established as follows:

- Dzongkhag Tshogdu (DT)
- Gewog Tshogde (GT)
- Thromde Tshogde (TT)
- Thromde Yenlag Tshogde (TYT)

The Dzongkhag Tshogdu will – in its area of jurisdiction – comprise two elected representatives from each Gewog (*Gup and Mangmi*), one elected representative from the Dzongkhag Thromde, and one elected representative from the Dzongkhag

Yenlag Thromdes. The LG Act provides increased powers and expanded functions to the local governments, which among others include: promotion of holistic and integrated area-based development/ land use planning; conservation and enhancement of the environment; regulation of natural resource uses; regulation of pollution; and organisation of relief measures in case of natural disasters and emergencies. The local government functions are operationalised through five-year and annual plans and budgets, which respectively are accumulated in RGoB's five-year and annual plans and budgets. The Dzongkhag Tshogdu will monitor and evaluate the Gewogs' implementation performance, whereas the Thromdes will conduct their own monitoring and evaluation.

The Local Government Act, which is designed enable effective decentralisation, provides a unique platform and opportunity to introduce operational GNH mainstreaming requirements to facilitate and/or inform: The preparation of Five-Year and annual plans; the identification of consensus based development priorities; the preparation of budgets; introduction of performance based monitoring of the effectiveness of development actions/investments; and others.

International Conventions ratified by the Kingdom of Bhutan:

In addition to National Legislation, Bhutan has become Party to a number of Conventions of relevance to both the Strategic Assessment and development choices that will be made by the Government in the area of influence considered in by this assessment. The Conventions are described in general terms below:

United Nations Convention on Biological Diversity **(CBD)*:*** The Convention on Biological Diversity was signed at the Rio "Earth Summit" of 1992. It included two binding agreements, the Convention on Climate Change, which targets industrial and other emissions of greenhouse gases such as carbon dioxide, and the Convention on Biological Diversity, the first global agreement on the conservation and sustainable use of biological diversity.

The Convention has three main goals:

- The conservation of biodiversity,
- Sustainable use of the components of biodiversity, and
- Sharing the benefits arising from the commercial and other utilization of genetic resources in a fair and equitable way

The Convention recognizes that the conservation of biological diversity is "a common concern of humankind" and is an integral part of the development process. The agreement covers all ecosystems, species, and genetic resources. It links traditional conservation efforts to the economic goal of using biological resources sustainably. It sets principles for the fair and equitable sharing of the benefits arising from the use of genetic resources, notably those destined for commercial use. It also covers the rapidly expanding field of biotechnology, addressing technology development and transfer, benefit sharing and bio-safety. Importantly, the Convention is legally binding.

The Kingdom of Bhutan acceded to the Convention on Biological Diversity in 1995.

Cartagena Protocol on Biosafety to the Convention on Biological Diversity: The Cartagena Protocol on Bio-safety is an international treaty governing the movements of living modified organisms (LMO's) resulting from modern biotechnology from one country to another. It was adopted on 29 January 2000 as a supplementary agreement to the Convention on Biological Diversity and entered into force on 11 September 2003.

The Protocol's aim is to protect biological diversity from the potential risks posed by LMO's and establishes an advance informed agreement procedure to ensure that countries are able to make informed decisions prior to importing or introducing LMO's into their territory. The Protocol adopts the precautionary approach detailed in Principle 15 of the Convention on Biological Diversity.

The Kingdom of Bhutan Acceded to the Cartagena Protocol August 2002.

United Nations Framework Convention on Climate Change (UNFCCC): The United Nations Framework Convention on Climate Change sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change. It recognizes that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases. Under the Convention, governments:

- Gather and share information on greenhouse gas emissions, national policies and best practices

- Launch national strategies for addressing greenhouse gas emissions and adapting to expected impacts, including the provision of financial and technological support to developing countries

- Cooperate in preparing for adaptation to the impacts of climate change

The Convention entered into force on 21 March 1994. The Kingdom of Bhutan Acceded to the Convention in 1995

The Kyoto Protocol: Is an international agreement linked to the United Nations Framework Convention on Climate Change. It was adopted in Kyoto, Japan, on 11 December 1997 and entered into force on 16 February 2005. The Protocol sets binding targets for 37 industrialized countries and the European community for reducing greenhouse gas (GHG) emissions. The Protocol lapses in 2012 and its binding replacement to the Protocol remains elusive at present.

The Kingdom of Bhutan Acceded to the Kyoto Protocol in 2002 and became a member in 2005.

United Nations Convention to Combat Desertification: The Convention to Combat Desertification was adopted on 17 June 1994 and entered into force on 26 December 1996. The kingdom of Bhutan Acceded to the Convention in 2004.

The principal purpose of the Convention is "to combat desertification and mitigate the effects of drought in countries experiencing serious drought and/or desertification" To achieve this goal, the Convention calls for action involving international cooperation and a partnership approach. It focuses on improving land productivity, rehabilitation of land, conservation and sustainable management of land and water resources. Such actions are intended to prevent the long-term consequences of desertification, including mass migration, species loss, climate change and the need for emergency assistance to populations in crisis.

***Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal*:** The Basel Convention is an International treaty designed to reduce the movements of hazardous waste between nations and, more importantly, to prevent the transfer of hazardous waste from developed to less developed countries (LDC's). The Convention other purpose is to minimise the amount and toxicity of wastes generated and to ensure that their management is carried out close to the source of generation and is environmentally sound.

The Convention entered into force in 1992 and the Kingdom of Bhutan acceded in 2004.

Vienna Convention for the Protection of the Ozone Layer: The Vienna Convention establishes a framework for international cooperation aimed at the development of policies and the formulation of suitable measures to protect human health and the environment against adverse effects resulting or likely to result from human activities, which modify or are likely to modify the ozone layer (art. 2[1][2]).

Specific obligations relating to the control and elimination of ozone-depleting substances (ODS) are contained in the Montreal Protocol on Substances that Deplete the Ozone Layer.

The Kingdom of Bhutan Acceded to and ratified the Convention in 2004.

***Montreal Protocol on Substances that Deplete the Ozone Layer*:** This Protocol to the Vienna Convention for the Protection of the Ozone Layer is an international treaty designed to protect the ozone layer through the phasing out of production of substances identified as the likely causative agents of ozone depletion. The principal causative agents are halogenated hydrocarbons containing either chlorine or bromine.

The Protocol entered into force on the first of January 1989 and Bhutan Acceded to the Protocol in 2004.

12.4 ANNEX-4: LIST OF PARTICIPANTS (WORKSHOP-1 AND 2)

S.No	Name	Designation, Organization	Workshop-1	Workshop-2	Email Address
1	Tandin Tshewang	ADAO, Punakha			tansee_09@yahoo.com
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3	Dorji Gyeltshen	AFO, Tsirang			
4	Namgyel Dorji	LRO, Tsirang			
5	Kuenzang	LRO, Punakha			
6	Tawchu	DYT Chair., Punakha			
7	Sahadev Thapa	DCPO, Wangdue			sthapa@druknet.bt
8	Sarita Gurung	GAO, Daga, Wangdue			saritaleo63@yahoo.com
9	Inchu Dolkar	GAO, Gaselo, Wangdue			inchudolkar@hotmail.com
10	Kuenzang Wangmo	GAO,Guma, Punakha			kuenzawangmo@yahoo.com
11	Rebecca Pradhan	Ecologist, RSPN			Rebecca@druknet.bt
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25	Ngawang Dorji	Dz Env Officer, Chukha			ngawa123@yahoo.com
26	Dorji Tshering	Chief Survey Engineer, National Land			
27	Sonam Dhargay	Sr. GIS Officer, National Land			dhargay@gmail.com
28	S. K Bhujel	AE, Tsirang			
29	Sonam	DAO, Tsirang			
30	Sonam Rabten	GAO, Dagana			ragu_rabten@hotmail.com
31	Lhawang Dorji	Chirman, Dagana			
32	Kelzang Tenzin	LRO,Dagana			
33	Sonam Tshering	DE, Dagana			
34	Sachin Limbu	Dz. Env officer,Dagana			sachin.limbu@gmail.com
35	Sonam Tobgay	Dz. Forest officer,Dagana			tobgays76@yahoo.com
36	Chewang Gyeltshen	ADAO,Gasa			chewanggyeltshen@yahoo.com
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53	Pema Lhazom	NECS	□	□	
54	Sonam Dargay	NECS	□	□	
55	K.B Rai	DCPO,Wangdue	□	□	
57	Ngawang Chophel	Planning, Tsirang	□	□	
58	Sangay Dorji	DzFO,Gasa	□	□	
59	Galey Dorji	ADFO,T/phu	□	□	
60	Sonam Dorji	DYT,Thimphu	□	□	
61	Tshering Gyeltshen	EE,DOR	□	□	
62	Passang	Engineer,DOR	□	□	
63	Sonam Tobgay	DzFO,Dagana	□	□	
64	Tashi Gyeltshen	Dy EE	□	□	
65	Yeshey	DYT,Tsirang	□	□	
66	Tenzin Wangchuk	ICTO,Tsirang	□	□	
67	Leki	SrFR,Wangdue	□	□	
68	Kezang Uden	GAO,Tsirang	□	□	
69	Needup Gyeltshen	GAO,Sarpang	□	□	
70	Langa Dorji	DEO,Sarpang	□	□	
71	Dorji Tenzin	GAO,Gasa	□	□	
TOTAL PARTICIPANTS			**54**	**45**	**29 PARTICIPANTS ATTENDED BOTH WORKSHOPS AND HAVE BEEN EXPOSED TO THE FULL PROCESS**

12.5 ANNEX-5: THE (ZERO OPTION) SCENARIO

	GROUP-1	GROUP-2	GROUP-3	GROUP-4	GROUP-5
BRIEF DESCRIPTION OF THE SCENARIO					
STATE AT TIME-0 (2009)	**Economic development & financial services** Existence of natural resources (minerals deposits, forest products, NWFP etc.), private sector at infant stage, few/no FDI. Existing small industries using out dated technologies, low profit, proprietor own business & access to market is limited. Limited financial institutions, monopoly & high interest rate and non-existence in rural areas. **Transport and Infrastructure** Road network along the basin narrow and not infiltrated latitudinal, traffic flow is moderate with less accident, non-existence of mass urban transport system & frequent roadblocks. Most remote areas not accessible by road, mode of transport is only road. **Strategic Infrastructure** Inadequate infrastructure with low standards/quality, low l coverage, pressure on the existing infrastructure, non-existence of infrastructures like	**Economic development and financial services** Subsistence farming prevailing. Seasonal tourism. Cottage industries. Sand and stone quarries. Limited financial institutions. **Transport and Infrastructure** Adequate transport facilities (expensive). Road connectivity limited to major towns. **Strategic Infrastructure** Sufficient basic facilities (education, VTIs, health). Partial coverage of telecommunication & e-communication facilities. 80% electrified. Emerging urbanization. **Tourism and Recreation** Seasonal tourism. Shortage of recreation facilities. N**atural Assets** Existence of natural resources (National Parks, timber, river, flora, fauna). Existence of undisturbed	1. Economic development The entire area of interest is at a low level of economic development. Mainly agricultural and livestock activities. Paddy, cash crops (apple, orange, and cardamom) in the valleys. Yak-herding and cattle rearing are also common on the present slopes. A few numbers of stone and sand quarries is supplying requirements of minor construction and to feed the small factories. The tourist facilities are not fully developed, mainly catering to transit type of tourist during peak season. Emerging hotel industry with improving facilities. One high-end hotel: Aman Kora Punakha. Chukha,Tala and Basochhu hydro power is operational generating 60MW power. Two industrial estates in Pasakha, one in P/ling, Wood-based industy in Darla/Gedu. Local textile industry in Chukha. Foreign trade is mainly through	**Economic and Financial services** The trade limits to the marketing of surplus farm products from the farm to the urban centres and basic necessity items from urban centres to the farm. There exist two stone quarries and two sand and stone factories. Many business ventures like shops, hotels, automobile workshops, gas stations are in placed. The financial needs are catered by BoB and BNB branch offices in the focus areas. The BDFC caters the financial needs of rural community **Transport and Infrastructure** There are adequate infrastructures and facilities like roads, communication, schools, health centres and training institutes. The mode of transport is only road ways and the roads are maintained frequently by the Department of Roads. . The Wangdue	**ECONOMIC DEVELOPMENT AND FINANCIAL SERVICES:** - Currently Dzongkhag Administration and the Central Government cater to all the development activities in the area. -No Financial Institutions - Existing BDFC - Mining in Dagana (quartzite, talc), Wangdue - Stone Quarrying -Logging -Army Welfare Project (Distillery) - Trade of cordyceps **TRANSPORT:** -Existing Highways, District roads and farms roads -Main form of transport is surface transport. Most people still walk to schools, villages, office, medical centres, market, government offices etc. I**NFRASTRUCTURE:** - Pocket settlements and declared satellite towns, District Towns - Existing Government

	airports/helipads, recreational facilities etc. **Tourism and Recreation** Potential for tourism (hiking, mountain biking, river rifting, bird watching, farm house stay etc), however tourist arrival are low and are mostly cultural based and there are limited recreational activities. **Natural Assets** **E**nvironment status still pristine, natural habitats are undisturbed and intact, no watershed management schemes, buffer zone for critical areas except for biological corridors in protected areas. The quarrying is carried out randomly. Forest resources are able to meet public demands. Prevalence of unsustainable harvest of NWFP's **Cultural Assets** Fully intact but prone to vandalism, theft and damage by natural hazards. **Population, Employment and Social Services** Low population density, more illiterate & employment issue is manageable. Free basic social services provided (health, education etc.) Availing service services takes longer time. **Climate and External Natural**	pristine forest. Existence of protected areas. Numerous catchment areas. **Cultural assets** Magnificent historical monuments. Numerous ancient temples and religious site. **Population, Employment and Social services** Low population density in the area. High rate of jobless school dropouts. Adequate number of health centres and schools. Insufficient safe drinking water. No proper waste management system. **Climatic and external natural factors** Unpredictable weather patterns. Emerging issue of GLOF. Changing of cropping pattern**.** **Agriculture and Land** Subsistence farming with partial mechanization. Scattered and limited land holdings. **Legal, regional and international issues** **Strict legal system in place.** **Insurgent militants.** **Sector and national policies,**	generation of revuenue through export of power to India from DGPC (CHPC, BHPC, THPC). Some agricultural products esp. Orange, apple are exported to Bangladesh and India. **2. Strategic infrastructure** Approx. 80% educational facility covered. Approx. 70% health coverage is achieved, with 30% remaining to be developed. Mobile coverage over 90% of the area. Electricity coverage has reached less than 20%. Road coverage has reached almost in 50% of the area of interest, but many of the roads are not functional in rainy season. Bridge development needs to take place all over the dzongkhags of basin-II. Planned airport in Gelephu. Properly planned townships exist at Khuruthang, Tsirang, Gelephu. Bajothang township construction has started. Major banks (BoB, BNB, BDFC) branches are estd. in many places and only Gasa does not have branch. GLOF Early warning system is already started implementation but no earthquake prediction or warning system. **3. Social services** Human resources development through improving quality of	bridge on East-West National Highway connects the western and eastern regions of Bhutan and there is proposal to widen East-West High Ways. The modes of transport include pony-porter, buses and taxi and goods are transported mainly by trucks. **Strategic Infrastructure** The education needs are catered by CPS, LSS, MSS, HSS and private school. There are adequate health facilities to meet the day to day health care of the people. The health services are catered by District Hospitals, BHUs and ORCs. Except for few pockets, the basin is accessible by B-mobile and Tashi cell. Few remote areas are connected by solar phones. There exists at least one urban centre in all the districts within the basin. The development of Bajothang township in Wangdue Phodrang on-going. **Tourism and Recreation** Few hotels and Resort were built to cater to tourism. The Dzongs, lhakhangs, hot-springs are the main tourist attraction. Tourists also visit the place during Domchoes and Tsechus hosted in the Dzongs. The natural landscape is used by	Institutions, schools, BHUs and Hospitals - Cottage industries - Small hotels **BRIDGES:** - Highway Bridges (approx. 5 nos), Dzongkhag Bridges - Suspension Bridges **SRATEGIC INFRASTRUCTURES:** - Basachu Hydro Power - Darachu Mini Hyropower, Power house **TOURISM AND RECREATION:** - Tourists destinations (Gasa, Punakha, Gangtey, Wangdue Dzong) - Waters sports (rafting) in Wangdue, Dagana & Punakha - Bird watching in Wagdue & Punakha - Camping and picnic spots - Tsechus - Eco-trail **NATURAL ASSETS:** - JDNP, JSWNP, Centennial Park, Royal Botanical & Recreational Park, Dikchu NP, Phipsoo Wild Life Sanctuary - Biodiversity/flora/fauna (blue poppy, red panda, Black necked crane, white

	Factors High risk from GLOF, vulnerable to epidemics, disaster coping mechanisms limited **Agriculture and Land** Thought limited arable land, fully utilized for agriculture/subsistence farming (once a year), land degradation. There is high dependency on agriculture (rural economy). **Legal, regional and International Issues** Local/international conflict over rights to natural assets, manageable anti-social issues **Sector and National Policies, Plans and Projects** Conflicting Policies/legislations	**plans and projects** Gross National Happiness. Poverty alleviation. Sustainable development. Decentralization. Constitutional Monarchy.	education, non-formal education and vocational training institute. The present health services is not upto the standard required. There is shortage of doctors, nurses, medicines and equipment. Drinking water supply coverage is available in 90% of the dzongkhags. Still a few sources of water have dried up and new sources have to be found. Agricultural extension services are available in all gewogs but need to be extended to all the chiwogs in order to promote agricultural productivity. Forestry services needed to be extended upto the chiwog level. Postal services only available at dzongkhag and dungkhag level but not at gewog and chiwog level. Waste disposal is a not properly done. No systematic collection of waste even in urban areas. There are a few land-fill sites which have to be improved in sanitary standards, and the numbers should be increased in other areas. Public transport services available in approx. 40% of the area. Taxis and bus services are entirely privatised. Financial credit services,	the picnic goers as picnic spot. The basin is also a attraction to shot Bhutanese movies. **Natural Assets** The basin is the habitat of wild life like the endangered bird white –bellied heron, Golden langur and Takin and aquatic fauna like Migratory fish- Katle and Mashir. The basin is also a source of timber, sand and boulders and non-wood forest products like mushroom, ferns and wild asparagus. The buffer zone of JDWNP also falls within the basin. **Cultural Assets** Four historical dzongs are located in the Basin namely Gasa, Punakha, Wangdue and Dagana Dzongs. In addition, one new Dzong meant only for Administrative function is constructed in Tsirang. Apart from Dzongs, many historical monuments like lhakhangs, gomdheys, shedras and chortens exist in the basin. **Population, employment and social service** On an average 20% of the population in every focus area are settled within 0.5 km radius from the river basin. Majority of the population depend on agriculture as source of livelihoods. Other	bellied heron, palas eagle, golden masher, Bengal tigers, etc.) - Punatsangchu - Hot springs **CULTURAL ASSETS:** - Dzongs, Lhakhags, monasteries, chortens - Tshechus - Religious ceremonies - Nyes (holy sites) **POPULATION, EMPLOYMENT AND SOCIAL SERVICES** - Population as per the census 2005. Have low population density. Currently, the population is manageable and in some areas still have pastoral/indigenous community with unique cultural and occupational identity. - Dominated by agrarian economy - Most people in the Dzongkhags go to Thimphu for employment (Rural – Urban Migration) - The jobs in Dzongkhags not seen to be attractive. Most people go to the Capital for medical, market and other services that are not provided for in the Dzongkhags.

			farmer's banking, mobile banking should be made available in the gewogs as it is only available in dzongkag level at present. Employment opportunities are mainly in small business contractors engaged in construction industry. Majority of people are working on small self-owned farms. **4. Natural assets/bio-diversity** This area has good forest coverage above approx. 70% of the area. None Wood Forest products like mushrooms, ferns, cane, cordyceps, medicinal herbs, should be harvested on sustainable basis. Commercial timber extraction is carried out scientifically in designated Forest Management Units, for rural construction requirements can be met from nearby forest to settlements. Critically endangered (<200 left in whole world) like white-bellied heron (~34), golden langur; and endangered species like, tiger, snow-leopard, black-necked crane, mahseer are found esp. In basin-II. Scienntific Watershed level management is not yet being carried out in the basin-II. There is not very serious land	off-farm activities include remittance, contract labourers, taxi-driving and rental. The basic education and medicines are provided free of cost by the Government. health hazard risk is very minimum with no widespread epidemics. However, there are malaria prone zones in the southern parts of the zone and other water borne diseases like diarrhoea, dysentery and typhoid are common. People have easy access to safe drinking water through schemes like RWSS and Municipal Water Supply. Work force mostly observed on farmland, RNR farms, private construction and few in hotels. The waste generated is manageable at the moment without proper waste disposal and treatment plants. Awareness campaigns on solid waste disposal are pursued through campaign and mass media. Human settlements and agricultural land are concentrated along the river banks. The lifestyle of most of the people is a typical rural life i.e self-sustenance with backyard farming and few settled in up-coming urban	- Currently, the social services in the Dzongkhags are fairly adequate. - Resettlement Projects for the landless in Southern Dzongkhags going on. **CLIMATE AND EXTERNAL NATURAL FACTORS:** - Depend on the monsoon and the melting of the snow from the snow capped mountains but currently, being affected by the changing weather patterns - Have incidences of GLOF - Recent flooding events due to continuous rain and swelling of rivers. - The inconsistent rainfall patterns (have either excessive rain causing disaster or no rain at all thereby drying up water source and agricultural land **AGRICULTURE AND LAND USE:** - Irrigation channels - Small land holdings and Subsistence farming - More dependent on monsoon for the wet land - Gasa the only organic farming Dzongkhag - Limited numbers of Improved livestock breed

			degradataion and therefore no land magnament campaigns have been carried out. There is no demarcation of buffer zones for any purpose but however there is strict enforcement of the rules and regulations of the country with regard to the protection of the forest (only forest line for forest fire control is cut). **5. Climatic issues & risks** GLOF is a serious climate-change induced risk for the basin-II region. Out of over 600 identified glaciers around 25 are considered dangerous. An early warning system has been put in place starting from Lunana glacier to Sunkosh. The glaciers estimated to be retreating at rate of 25-30 meters annually in the Himalayan region. In last five years, there has been perceptible rise in temperature across the region as well as some extreme rainfall events. **6. Law and order** The northern border is closed and there is regular Border District Coordination meetings (BDCM) to discuss southern trans-boundary issues and security issues with the Indian counterparts. There is significant number of	centers like Bajo and Kuruthang. **Climate and External Natural Factors** Due to global warming and green house effect the melting rates of glacial have increased and snow fall reduced and erratic rainfall experienced in the recent years effecting vegetations growth and their yield. Basin II falls under identified high risk areas to be affected by GLOF from lunana. Mitigation works are going on at the site at Lunana and at the same time awareness campaigns. **Agriculture and Land** Subsistence farming – wet land & dry land production (production of paddy, rice, millets) Semi-commercial production (oranges, vegetables, livestock). Farm roads are being constructed to provide access to the far flung villages to market their farm produces. The land management practices plantation and bio-engineering are confined to protect agriculture land. The river training works and embankment were carried out to protect urban **centre and agriculture land.**	- Using semi mechanized farming technique - Growth of wild pests like wild boars, wolves, elephants etc. due to human encroachment on the natural habitat (Severe Human wildlife conflicts). - Land degradation increasing - Increasing Land use change in the projected areas (changing the land pattern) - Increasing land fragmentation **SECTOR AND NATIONAL POLICIES, PLANS AND PROJECTS:** - 10^{th} Five year Plans - Construction of Gasa District Road - Construction of farm roads, District Roads - Rural Waters Supply Schemes - Rural Electrification projects - Rural School expansion - Preparation of Punatsangchu Project - Preparation Daga Chu Hydro Power Project. - Plan for development of railway and airport in Sarpang

			legal foreign workers in the construction industry, road construction and other small industries. Some cultural dilution is gradually increasing or taking place. **7. Humanitarian/social issues** Right now there is no serious social issues like displacement, however there is some resettlement in the southern region viz. In Dagana, Sarpang and Tsirang. Rural-urban migration is taking place and only old people are left in the farms. Joblessness and lack of employment opportunities are on the increase. The youth labour available often donot possess the required qualifications and skills. There is not much youth related anti-social issues. There is no noticeable urban slums in this region. The national popn. Growth rate is around 3.1%, which is quite high. This region is rich in natural resources. HIV/AIDS, H1N1 and such diseases are not prevalent in the region. There is a high percentage of human-wildlife conflict which exists in this region. **There is not much gender**	**Legal, Regional and International Issues** We share a close tie with the neighbouring country-INDIA and also the situation all along the region is calm with vibrant security positions. Our country has impermeable borbers in the the south and in the north which therefore don't allow any infusion of foreigners. Our culture has also been intact and prevalent since times unknown. Appropriate laws and rules like Land Act 2007, GYT & DYT Chathrims were in placed. Legislative bodies like GYT & DYT were formed at Gewog and District level to implement Government plans and policies. The members of these legislative bodies are elected by the people. The legislative bodies are adequately supported by the executive arm- District Administration. **Sector and National Policies, Plans and Projects** The 10 FYP is in the second year of implementation. The Dzongkhag and gewog based activities include farm road construction, rehabilitation works and other community development works. The works	- Awareness on Disaster Management ENVIRONMENTAL DEGRADATION

			issues. **The gap between rich and poor is not so noticeable.** **8. Enabling environment** The local government capacity requires to be strengthened. Disaster management is not yet fully implemented at the local level. Appropriate laws, rules, and regulations are sufficient for the present requirements. Effective implementation of government policies is taking place.	works on Punstsangchu-I is on-going and many more hydro projects are planned in the basin. The widening of Phuentsholing-Thimphu National Highways (NHW) is on-going and there is proposal to widen Thimphu-Trashigang and Thimphu-Sarpang NHWs. In addition, there is also proposal to construct new Highway from Phuentsholing to Daga Pela via Lhamoizingkha.	
STATE AT+5 YEARS (2014)	**Economic development & financial services** Existence of natural resources (minerals deposits, forest products, NWFP etc.), private sector at infant stage, few FDI. Existing small industries investing in technologies, low profit, proprietorship business. Limited financial institutions, monopoly & high interest rate and starts catering to rural communities. **Transport and Infrastructure** Road network along the basin widened and series of minor roads connecting communities constructed, traffic flow increases with higher rates of accident. Introduction of mass urban transport system in few towns. Frequent road blocks.	**Economic development and financial services** Subsistence farming still prevalent. Increased tourism. Cottage industries. Stone quarries. New financial institutions established. Transport and Infrastructure Improved transport facilities. Better road conditions. Wider road network (farm road constructions). **Strategic Infrastructure** Enhanced and accessible basic facilities (education, VTIs, health). Coverage of telecommunication & e-communication facilities to most of the Basin II areas.	**1. Economic development** Prices of commodities have increased a lot due to the high workers population on the Punatsangchu-I project which has started in 2009. Commercial Farming production will get increased a lot as demand increased due to increased population. Revenue generated by Chukha,Tala and Basochhu Hydropower plants may help and be used in funding development of the Punatssangchu Hydropower projects. **2. Strategic infrastructure** Lhamozingkha-Dagana feeder road construction has started. More number of hospitals and school at Wangdue dzonghag	**Economic and Financial services** With good network of road and market, farmers will commercialize their farming activities. There will be more exploitation of natural resources like timber, sand and boulders. The financial institutes will open more branch offices. New company may venture into banking and insurance business. **Transport and Infrastructure** The mode of transport may remain the roads only but investments may be done on existing rural roads by providing base course and stone-pitched drainage throughout the whole length The widening works of Tsirang-	**ECONOMIC DEVELOPMENT AND FINANCIAL SERVICES:** - Geog Administration will be strengthened. - Thromde Tshogde will be in place - Local government elections - NGO and civil societies increased -New Banks and its branches and banking system in place -Mining and Quarrying activities intensified and increased. - Increased number of tour operators **TRANSPORT:** **-**Increased in vehicular transport (two fold) - Decrease in pedestrian and animal transport - Easy accessibility of people

	Most remote areas accessible by road, mode of transport of only road. Strategic Infrastructure Adequate infrastructure with low standards/quality, no full coverage, pressure on the existing infrastructure, non-existence of infrastructures like airports/helipads, recreational facilities etc. **Tourism and Recreation** New tourism products introduced and implemented. Limited recreational activities. **Natural Assets** Environment status still pristine, natural habitats get disturbed, no watershed management schemes or buffer zone for critical areas. Forest resources are able to meet public demands. Sustainable harvest of NWFP's **Cultural Assets** Fully intact but prone to vandalism, theft and damage by natural hazards. **Population, Employment and Social Services** Population grows, more illiterate & employment issue is manageable, displacement of settlement due to developmental activities and increase in anti-social activities. Basic social services provided	95 % electrified. Increasing rate of urbanization. **Tourism and Recreation** Increased tourism. Few recreation facilities. **Natural assets** With a better road network, urbanization, developmental activities there will be exploitation of natural resources (outside core zone of protected areas). Decreased GRF. Existence of protected areas. Catchment areas protected. Human-wildlife conflict. **Cultural assets** Magnificent historical monuments. Numerous ancient temples and religious site. **Population, Employment and Social services** Increasing population (Migration, immigrant labourers). Decreased jobless school drop-outs (most will be recruited because of upcoming Punatsangchhu Project & other development activities induced by it). Upgraded health centres and schools. New water sources to be identified.	**3. Social services** Health and education services will be improved and upgraded to meet the requirements of the people. Farming population has decreased. Waste management facilities will be set up. Cultural heritage has been maintained. **4. Natural assets/bio-diversity** Forest cover in the basin-II region will decrease. Natural resources will deplete. Some habitat loss (white-bellied heron Mahseer and Golden Langur) **5. Climatic issues & risks** Glaciers retreat rate may increase Early warning system improved **6. Law and order** Law and order is maintained with adequate resources **7. Humanitarian/social issues** Rural-urban migration has accelerated. New areas of settlement have come up. Displacement of affected population has taken place. Lot of employment opportunities due to the project. Health hazards have increased 8. Enabling environment	Sarpang will begin. The pre-investment studies of P/ling-Daga Pela NHW will start. **Strategic Infrastructure** Up gradation of few schools and construction of BHUs and ORCs might take place. The development of Bajo township will be completed. The coverage of B-Mobile and Tashi Cell might increase**.** **Tourism and Recreation** Tourism and recreation services will more remain the same. **Natural Assets** The volume of timber, sand and boulders and non-wood forest products available in the basin may reduce the wild life animals found in the basin may also decline. **Cultural Assets** Few lhakhangs may be constructed. **Population, employment and social service** Population in the focus area will increase with the inflow of foreign workers for Punatshangchu project. Majority of the population depend on agriculture as source of livelihoods. Other off-farm activities include remittance, contract labourers, taxi-driving and rental may	to the market and centres for other basic facilities. - Increased oil distributors. **INFRASTRUCTURE:** - District towns developed (Sarpang) - The conditions of the National Highway, district roads improved. - More number of bridges, suspension bridges constructed. - Basic service facilities for the public provided. - Increased number of higher, middle and lower secondary schools - Increased number of hotels. **TOURISM AND RECREATION:** - Increased number of tourists which needs to be managed and also basic facilities services will be in place. - Tourist's destinations increased because of the increasing number of tourists and identification and development of tourist destinations. - More eco-trail and mountain trails identified. **NATURAL ASSETS:** - Habitat of the white-bellied heron disturbed.

	(health, education etc.) still free. Improvement in providing service delivery **Climate and External Natural Factors** Risk mitigation from GLOF, vulnerable to epidemics, disaster coping mechanisms very less. **Agriculture and Land** Slight changes in land use pattern (agriculture and forest land being used for urbanization and infrastructure development). **Legal, regional and International Issues** Local/international conflict over rights to natural assets, anti-social social issues increases**.** **Sector and National Policies, Plans and Projects.** Conflicting Policies harmonized through proper protocol	Waste management system still prevalent. **Climatic and external natural factors** Unpredictable weather patterns. GLOF risks still persist. Changing of cropping pattern. **Agriculture and Land** Subsistence farming still but more mechanized. Adaptation to new farming patterns. Scattered and limited land holdings. Land-use conflicts. **Legal, regional and international issues** Insurgent militants. Trans-boundary water use conflicts. Sector and national policies, plans and projects Gross National Happiness. Poverty alleviation. Sustainable development. Constitutional Monarchy. Local political interventions. More Decentralization. Strong and rigid policies to conserve natural assets.	Local government has been strengthened a lot. It is very important to manage water bodies and resources properly in view of the enormous potential for hydro-power generation. Erratic weather and rainfall pattern causes land degradation, change of vegetation, crop damage, human disease (diarrhoea, malaria, dengue fever**)**	increase with rise in population.. there will be employment created by Punatshangchu project. waste generated will increase double fold **Climate and External Natural Factors** Due to global warming and green house effect the melting rates of glacial have increased. Numbers of erratic snow and rainfall may experience affecting vegetations growth and livelihood of people. **Agriculture and Land** Production pattern of farmers may change from subsistence farming to commercial farming due to increase in market. More farm roads will be constructed. Agricultural land might be taken by the Punatshangchu Project. **Legal, Regional and International Issues** The Indo-Bhutan friendship may grow stronger. **Sector and National Policies, Plans and Projects** The Dzongkhag and gewog based activities of the 10th FYP may be achieved. The 11th FYP The works on Punstsangchu-I will be in full swing and	- Increased hot spring users due to easy accessibility. **POPULATION, EMPLOYMENT AND SOCIAL SERVICES** - Population will be increased (due to the number of labours and project people) - Boom in business activities converging mostly in Punakha-Wangdue-Sunkosh-Damphu. - Rural – Urban Migration decreased marginally - Social services/facilities increased - Increased crime rates - Waste Management issues - Diseases increased. - Increased employment opportunities in Hydro Power Projects increased. - Increased number of heavy vehicles for the transport of raw materials for the construction of the Punatsangchu Projects. **CLIMATE AND EXTERNAL NATURAL FACTORS:** - More erratic weather patterns. - Possibilities of GLOF, earthquake since the geographical terrain of

				Punatshangchu II may be started.The widening of Phuentsholing-Thimphu National Highways (NHW) may be completed. The road widening works of Thimphu – Sarpang will start.	the project sites get disturbed. **AGRICULTURE AND LAND USE:** - More Irrigation channels constructed and planned. - Farming practices decreased. - Most of the agricultural land used for other development activities (like hotels, schools, housing etc.) - More land fragmentation - Change from subsistence farming to commercial farming (potential based farming). - Changed land use pattern with many development infrastructures in place. - Human wildlife conflicts increased. **ENVIRON. DEGRADATION** - Project area suffer from noise and air pollution - Aesthetic decreased due to scarring, excavation for tunnel works - Increased amount of solid waste, construction waste and excavated spoils from construction site.
STATE AT+10 YEARS (2019)	Economic development & financial services **Existence of natural resources (minerals deposits, forest**	Economic development and financial services **Reduced subsistence farming (farmer population**	1. Economic development **Tourism industry will increase due to the attractive parks on reservoir and entertainment**	Economic and Financial services **Farm production becomes more market-oriented and**	**ECONOMIC DEVELOPMENT AND FINANCIAL SERVICES:** - Punatasangchu, Dagachu Project Commissioned

	products, NWFP etc.), private sector begins to develop, increase in FDI. Existing small industries investing in technologies, profit increases in companies. **Adequate financial institutions, competition & interest rate begins to decline & branch offices to rural communities will be established.** Transport and Infrastructure **Road network along the basin widened and series of minor roads connecting communities constructed, traffic flow increases with higher rates of accident. Distance between Thimphu & Wangdue will reduced with road tunnelling. Introduction of mass urban transport system in most urban areas. Frequency of road blocks reduced. Most remote areas accessible by road, alternative modes of transport in pipelines.** Strategic Infrastructure **Adequate infrastructure & standards/quality improves, full coverage, pressure on the existing infrastructure reduced, less fuel wood consumption, airports/helipads gets due consideration, recreational activities will be available in most urban canters.** Tourism and Recreation	**decreased).** **Increased revenue from increased tourism industry.** **Set up of more cottage industries.** **Stone quarries increased.** **Advanced financial institutions built-in.** **Transport and Infrastructure** **Improved transport facilities.** **Better road conditions.** **Upgradation of farm roads to feeder roads.** **Tunnelling.** **Helicopter services (Chencho wood–helicopter services in partnership with Bill Gates).** Strategic Infrastructure **Enhanced and accessible basic facilities (education, VTIs, health).** **Coverage of telecommunication & e-communication facilities in almost all parts of the Basin II. 100 % electrified.** **Urbanization.** Tourism and Recreation **Tourism expands, diversifies and sites are developed (Visit of Uncle ET, Jadoo with Hrithik).** **Adequate and advances recreation facilities.** Natural assets **With a better road network, urbanization, developmental**	**facilities** **Internal tourists numbers may increase** **Cottage industries due to tourist industry will come up** **More mechanized, commercial farming projects** **Tourists destination may increase in rural areas** 2. Strategic infrastructure **Punatsangchu-I project completed and generating more revenue** **IT facilities will be improved** **International class educational facility will be estd. (~1,000 acres campus)** **Gelephug airport completed** 3. Social services **Social services will be further improved with modern technology and equipment.** **Waste recycling should be promoted.** **Banking and other institutional services provided in the gewog level** 4. Natural assets/bio-diversity **Reforestation, afforestation programmes are pursued and Biodiversity is actively protected.** **Mahseer may not be able to migrate due to high hydro-dams and are at serious risk.** **Enforcement of buffer zones is improved.**	**demand driven. Farmers venturing into production of exotic fruit meant for export. People have choices of banking facilities and banking services becoming more customer-friendly.** Transport and Infrastructure **The construction of P/ling-Dagapela NHW might begin.** Strategic Infrastructure **Punatshangchu I will be completed. One or two private school might come up. Health services catered through well staffed Dzongkhag and project Hospitals.** Tourism and Recreation **More Hotels and resorts may come up.** Natural Assets **The habitat of white –bellied heron, Golden langur, Takin and aquatic life will be Disturbed. The migratory Mashir fish will no longer be seen in the areas. More damages to the environment due many construction works more bio-engeneering may be carried out.** Climate and External Natural Factors **Possibility of GLOF and floods due to incessant rainfall. The basin will experience rise in**	- There will be more commercial activities - More service sectors (Hotels, resorts, handcraft shops, clinics etc.) - More investment in industries/SMEs because of assessable raw materials, market, labour - More investment pocket towns in the Basin 2 - There will be diversification of services provided by financial institutions - Growth of existing financial institutions and introduction of new financial institutions and services - Diversification of crops and livestock to meet the increased demand of the population. - Private sector encouraged, expanded and strengthened - Standard of life for the localities improved. **NATURAL ASSETS:** - There will be more demand of timber, stones, sand, marble etc. leading to the exploitation of natural resources. - Drying up of water source because of the increasing demand and also due to man made disasters

	New tourism products fully utilized by the tourist in all season. More recreational activities. Natural Assets **Environment status still pristine, natural habitats get disturbed; start watershed management schemes or buffer zone for critical/protected areas. Forest resources are able to meet public demands. Sustainable harvest of NWFP's** Cultural Asset **Fully intact but prone to vandalism, theft and damage by natural hazards.** Population, Employment and Social Services **Population growth increases especially in urban centres, literacy rate increases & employment issue reaches minimum. Basic social services provided (health, education etc.) are free. Improvement in providing service delivery** Climate and External Natural Factors **GLOF risk mitigated from Thorthormi completely, vulnerable to epidemics, disaster coping mechanisms improves. Early warning system installed and operational**. Agriculture and Land **Changes in land use pattern**	**activities there will be exploitation of natural resources (outside core zone of protected areas).** **Decreased GRF.** **Existence of protected areas.** **Catchment areas protected.** **Human-wildlife conflict.** Cultural assets **Magnificent historical monuments.** **Numerous ancient temples and religious site.** **Decrease in the number of Bhutanese traditional Chims (houses).** **Emergence of different religious groups.** Population, Employment and Social services **Increasing population (Migration).** **Decreased jobless school drop-outs.** **Upgraded health centres and schools with better facilities.** **Improved quality of life.** **Adoption of new technology to solve drinking water problem.** **Increase in waste generation.** **Waste management problem minimized (Incinerators, proper landfills).** Climatic and external natural factors **Unpredictable weather**	5. Climatic issues & risks **GLOF mitigation measures are put in place and highly technical early warning systems are improved.** 6. Humanitarian/social issues **Social issues increases due to continued work on the new project sites and also the increased populations in the towns.** **There will be continued displacement and resettlement of people affected by the projects.** **Some slums will come up due to urban poverty and gap between rich and poor increases.** 7. Enabling environment **Local government capacity in place and able to meet the challenges of local development.** **Disaster management system fully developed and given high priority.** **Up-stream development plans needs to be carefully reviewed before they are approved.**	**temperature. The river water level may increase due to more glacial melting, thereby increasing the risk zones.** Population, employment and social services **The radius area of settlement form the river bank may expand beyond 0-5 km. around 40% of the population may settle near the project area.** **The waste generation will double up.** **Chances of spreading diseases like STD & HIV/AIDs due to concentration and more interaction of people.** **More people will be absorbed in construction.** Sector and National Policies, Plans and Projects **Policies will be framed with wider public participation. Plans will be results-oriented. Many projects beneficial for the people will be funded from the domestic revenue. People will be more aware on democratic principles and institutions.**	(exploitation) - Decrease in the number of blacked necked crane and white bellied heron. - Decrease in the biodiversity in the flora and fauna INFRASTRUCTURE: - Hydropower generation infrastructures at Punatsangchu 1 & 2 in place. - Double lane Highway connecting Gelephu to Thimphu - Need for parks and other recreational facilities. - Construction of Landfill, transfer station for the disposal of the ever increasing wastes. - Power transmission and distribution lines in place. - Automobile work shops in place. - Urban Infrastructures including service utilities (storm water drainage, sewerage, street lightings, etc.) in place - Hotels and extended government institutions constructed and in place. - Housing facilities constructed. **TOURISM AND RECREATION:**

	(agriculture and forest land being used for urbanization and infrastructure development). Government and farmers investing in sustainable land management. Legal, regional and International Issues **Local/international conflict over rights to natural assets gets resolved, anti social issues increases** Sector and National Policies, Plans and Projects **Conflicting Policies harmonized through proper protocol**	**patterns.** **GLOF risks still persist.** **Changing of cropping pattern.** Agriculture and Land **Subsistence farming limited to outskirts.** **Intensive farming practices (sustainable food sufficiency will be an issue).** **Congested and limited land holdings.** **More land-use conflicts.** **Visible land degradation.** Legal, regional and international issues **Trans-boundary water use conflicts aggravated.** Sector and national policies, plans and projects **Gross National Happiness.** **New vision.** **Sustainable development.** **Decentralization.** **Constitutional Monarchy.**			- Tourism expanded and diversified. **POPULATION, EMPLOYMENT AND SOCIAL SERVICES** - Dramatic increase in population - Rate of Rural – Urban Migration decreased - Increased employment opportunities - Employment avenues will diversify **SOCIAL ISSUES:** - Displacement of settlements. - Need of resettlement/rehabilitation - Loss of cultural values, tradition and land use - Cultural dilution - Disintegration of joint family system. - Old traditional houses removed/dismantled and replaced with new architecture. - Increased crime rates, vandalism, drug abuse etc. - Increase of the rate of diseases (HIV AIDs) **CLIMATE AND EXTERNAL NATURAL FACTORS:** - More erratic weather patterns.

					- Possibilities of GLOF, earthquake since the geographical terrain of the project sites get disturbed. **AGRICULTURE AND LAND USE:** - Decrease in cultivation of agricultural land - Remaining agricultural land will be fully mechanized. - Change in agricultural pattern where people cultivate giving way for commercial crops. Subsistence farming may be non-existent/reduced. - Agricultural land converted to housing colonies and other commercial purposes. - Privately owned land will be used for plantations. **TRANSPORTATION AND COMMUNICATION:** - ICT developed - Increased number of vehicles and other modes of transport. **ENVIRONMENT DEGRADATION** - Increased noise, air, and water pollution - Water sources encroached and polluted. - Quality and volume Rivers

					and lake water deterioted. - Decrease in the number of water catchments areas. - Increased amount of waste generation. - Exploited natural forests
STATE AT +20 YEARS (2029)	Economic development & financial services **Optimum utilization/exploration of natural resources (minerals deposits, forest products, NWFP etc.), private sector become engine of economic growth, FDI in most priority sectors. All industries uses latest and cleaner technologies generate maximum profit in all companies.** **Different financial institutions providing wide range of services and choice, competition & full coverage.** Transport and Infrastructure **Road network & conditions meets international standards, all corners of communities connected by road, traffic flow increases but rates of accident decreases. There will be road tunnels, mass urban transport system operational & other modes of transport (sky train, railways, and water transport)**	Economic development and financial services **Intensive farming (with increased mechanization).** **Lesser revenue due to slow down in tourism industry.** **Small scale industries (environment friendly).** **Commerce and trade expands.** **Stone quarries decreased.** **More and competitive financial institutions with better facilities.** **Growth of private sectors.** Transport and Infrastructure **Improved transport facilities.** **More service centres.** **Increase in pollution.** **Better road conditions.** **Upgradation of feeder roads to district roads.** **Major cities connected through tunnel sub-ways.** Strategic Infrastructure **Well established facilities (both basic and comfort).**	1. Economic development **Punakha-Wangdue will be one economic and administrative unit to meet the demands of a 1 lac plus metropolitan population.** **Macro-economy will develop but the local/micro economy will be decreased.** **The tourism sector will be mainstay of the local economy in the region.** 2. Strategic infrastructure **All the hydro-power projects in the basin-II are completed.** **Road network connectivity is completed: Dagana-Lhamozingkha, Chukha-dagana, Getena-Chukha.** 3. Social services **Some of the high earnings from hydro-power export will be channelled to local social services, which will be maintained at a very high level/standard.** 4. Natural assets/bio-diversity **Additional efforts and funding**	Economic and Financial services **The economy of the area may rise to a great extent with high income level of the people. Each household at the rural level may own a car. The farm production may increase vigorously than the previous years.Few big companies may set up their private banks. Per capita income increased by three-folds.** Transport and Infrastructure **Roads access to all gewogs and villages. The the National Highway may be upgraded to spacious (double lane). But number of vehicles may increase giving rise to a greater traffic congestions and problems. Hi-quality bridges may replace the existing ones.** **There may be a underground railway network constructed to connect the north and southern part of the basin**	**ECONOMIC DEVELOPMENT AND FINANCIAL SERVICES:** - Well established government institutions, service sectors, financial institutions and business/commercial sectors. - Self reliant economy - Democracy firmly based - Private sector well established. **INFRASTRUCTURE:** - Necessary strategic infrastructure in place. **TOURISM AND RECREATION:** - Increased number of tourists and tourist destination. **POPULATION, EMPLOYMENT AND SOCIAL SERVICES** - **Increased population.** - Better employment opportunities. - Improved quality of life

	will be developed. Strategic Infrastructure **Adequate infrastructure & standards/quality improves, full coverage, pressure on the existing infrastructure reduced, less or no fuel wood consumption & there will be second international airport and few domestic airports, recreational facilities will be available in most urban centres.** Tourism and Recreation **Tourist arrival increases unreasonably in all season and number of bed night stay increases too. Wide range of recreational choice will be available** Natural Assets **There will be no random quarrying, environment status still pristine but natural habitats get displaced. Watershed management schemes or buffer zone for critical/protected areas would have been completed. Forest resources would be controlled for use by creating alternative.** Cultural Assets **While cultural sites would be fully intact, there will be increased vandalism, theft and damage by natural hazards. Modernization will affect the**	Tourism and Recreation **Tourism industry slow down (with deterioration of environmental and culture)** **Regional tourism increased.** **Pressure on recreation facilities.** Natural assets **With a better road network, urbanization, developmental activities there will be exploitation of natural resources (outside core zone of protected areas).** **More community forests established.** **Existence of protected areas.** **Catchment areas protected extensively.** Cultural assets **Magnificent historical monuments.** **Numerous ancient temples and religious site.** **Decrease in the number of Bhutanese traditional Chims (houses).** **Emergence of different religious groups.** *Population, Employment and Social services* **Population continue to increase.** **Increased demand on health care and educational services.** **Increased employment issues.** **Upgraded health centres and**	**will be allocated to the conservation of nature in the region.** 5. Climatic issues & risks **Focus is given to the mitigation of Glof risks to the hydropower projects.** 6. Humanitarian/social issues **The population will be stabilized.**	**area. This railway will be then used to transport goods and people.** Strategic Infrastructure **Up gradation of few schools and construction of BHUs and ORCs might take place. One or two private school might come up. The focus area will be fully electrified** Tourism and Recreation **There will be several recreational areas in the basin giving rise to tourist attraction. There may be boating and swimming facilities available.** Natural Assets **Few dams will be constructed which will reduce the flow of water thereby will be possible to establish plantations downstream. However, few flora and fauna may get extinct due to scarcity of water.** Climate and External Natural Factors **Possibility of GLOF and floods due to incessant rainfall. The basin will experience rise in temperature. The river water level may increase due to more glacial melting, thereby increasing the risk zones.** Population, employment and social services	with increase in the living standards. SOCIAL ISSUES: - Loss of cultural values, tradition and land use - Cultural dilution - Decrease in ethnic groups - Disintegration of joint family system. - Increased crime rates, vandalism, drug abuse etc. - Increase of the rate of diseases (HIV AIDs) - Big gaps between the *haves and the have nots*. **AGRICULTURE AND LAND USE:** - Diversified and fully mechanized agricultural farming system. - Reduced land for agricultural purposes. **TRANSPORTATION:** - Increased number of vehicles, flow of traffic and number of accidents. - Public transport system improved. **ENVIRONMENT DEGRADATION** - Increased noise, air, and water pollution - Water sources encroached and polluted. - Quality and volume Rivers and lake water

	cultural values among the youth. Population, Employment and Social Services **Population growth/density increases especially in urban centres, literacy rate increases & employment issue reach minimum. Basic social services provided (health, education etc.) with minimum frees. Improvement in providing service delivery** Climate and External Natural Factors **GLOF risk mitigated from Thorthormi completely, vulnerable to epidemics, disaster coping mechanisms improves. Early warning system, search & rescue team operational.** Agriculture and Land **There will be changes in land use pattern due to urbanization. Agriculture activities will be fully modernized and mechanized. Land management will be carried out in all regions.** Legal, regional and International Issues **Local/international conflict over rights to natural assets gets resolved but anti social issues increases**	**schools with better facilities.** **Increase in prevalence of diseases (water borne, air borne, HIV, obesity, Influenza).** **Adoption of new technology to solve drinking water problem.** **Increase in waste generation.** **Waste management problem minimized (Incinerators, proper landfills).** **Improved quality of life.** Climatic and external natural factors **Unpredictable weather patterns.** **GLOF risks still persist.** **Changing of cropping pattern.** Agriculture and Land **Intensive farming with increased mechanization (sustainable food sufficiency will be an issue).** **Commercial farming.** **Congested and limited land holdings.** **More land-use conflicts.** **Increased land degradation.** Legal, regional and international issues **Trans-boundary water use conflicts still an issue.** Sector and national policies, plans and projects **Gross National Happiness.** **New vision.**		**Dependence on agriculture as source of livelihoods will decline. People have easy access to safe drinking water by installation of water treatment plants. The waste generated is managed with establishment of proper waste disposal and treatment plants.** Sector and National Policies, Plans and Projects **Vibrant democracy established. All Gewog Centers connected by motor able road. All villages electrified.**	deteriorated. - Decrease in the number of water catchments areas. - Increased amount of waste generation. - Exploited natural forests

	Sector and National Policies, Plans and Projects **Conflicting Policies harmonized through proper protocol**	**Strong and rigid policies to conserve natural and cultural assets.** **Decentralization.**			
EXPECTED SECTOR/ISSUE BASED IMPACTS (Can be Direct or Indirect or both: ranked as Y/N +/-1,2,3) for Time @0,+5,+10,+20 yrs.					
ECONOMIC DEVELOPMENT AND FINANCIAL SERVICES	**Y, Y: 1,1,2,3** Economic development at infant stage and huge potential for further growth with FDI.	**Y, Y: 1,2,3,3** Due to the establishment of projects along Basin II, revenue generated from different industries like tourism, financial & cottage industries, hotels, etc., will contribute to the GDP of to the Nation as a whole.	**Y, Y: 0,1,2,3** The local economy will peak in the T+10 period and once the HPP are complete there will be a decrease to a stable level.	**Y, Y: 1,1,2,3** Majority of the people are agrarian but with good	**Y, Y: 0,1,2,3** Economic self reliance achieved.
TRANSPORT AND INFRASTRUCTURE (ROADS, BRIDGES ETC)	**Y, Y: 1,1,2,3** Transportation infrastructure will develop over the time with alternative modes of efficient transport in place & rural connectivity will control migration	**Y, Y: 1,2,3,3** Road network will be increased and improved enhancing accessibility to markets and basic facilities.	**Y, Y: 1,2,3,3**	**Y, Y: -1, -1, 1, 2** Most areas will be accessible due to improved road network. However, there is a likelihood of more accidents	**Y, Y: 1,2,2,3** Expansion of facilities due to Improved transport infrastructures
STRATEGIC NFRASTRUCTURE	**Y, Y: 1,1,2,3** Inadequate infrastructures possess pressure on those existing. With development quality infrastructure will replace the existing & enhance the livelihood of people.	**Y, Y: 1,2,3,3** Due to development activities, better infrastructures will be in place.	**Y, Y: 0,1,2,3**	Y, Y: 1,1,2,3 Basic infrastructures are there but need to be strengthened	Y, Y: 0,1,2,3 Revenue generation and overhead infrastructure in place.
TOURISM AND RECREATION	**Y, Y: 2,2,3,3** Existence of tourism in the region has developed the region. Further promotion will depend on the development of new products, enabling environment & implementation.	**Y, Y: 1,2,3,2** Though tourism industry will boom in the beginning and continue for the first few years, it's likely to slow down in the later years due to loss of cultural and natural assets.	**Y, Y: 0,0,1,3**	**Y, Y: 1, 1, 1, 2** Currently the tourism industry is underdeveloped. As the road network unfolds we expect positive results. More investment in tourism, more tourists coming	**N, Y: 1,1, -1, -1** Increased number of tourist thereby increasing cultural dilution, increase in waste generation.

		Similarly, due to increasing population, there will be a pressure on recreation centres.			
NATURAL ASSETS	**Y, Y: 3,3,2,2** While utilizing the natural resources for development, preservation and conservation will remain top priority at the national & international level.	**Y, Y. 3,2,1, -1** With development activities in full swing, it is expected that the natural assets will deteriorate.	**Y, Y: 3,1,1,2** During project period, not much tourism development. On completion, there will be very good tourism industry.	**Y, Y: 1,2,2,2** Due to constructions of hydropower plants more pressure put on the natural environment	**Y, Y: -1, -1, -2, -2** Severe pressure on natural assets
CULTURAL ASSETS	**Y, Y: 2,2,2,2** Culture preservation & promotion will continue to flourish. However challenges like vandalism & theft of chorten and temples will increase in future.	**N, Y: 3,3,2,2** The cultural asset is probable to be threatened in long run with modernization and external influence.	**N, Y: 0, -1, -2, 1** Some irreversible losses of biodiversity will occur. Re-generation of forest and its resources takes time to recover to original level, which may not be attained in 20 years.	**Y, Y: -1, -1, 1,1,**	**Y, Y: 2,2,1, -1** Dilution of culture and loss of Bhutanese values and loss of community belongliness
POPULATION, EMPLOYMENT AND SCIAL SERVICES	**Y, Y: 0,1,2,2** The existing services are inadequate to cater to the growing population. With more developmental activities social services will improve and more employment opportunities will be created.	**Y, Y: 1,2,3,3** Owing to the availability of better facilities, living standard of the people will improve drastically. There will be more employment opportunities in the early phase of the project, however, in the later stage unemployment will be an issue.	**Y, Y: 0,2,3,1** Foreign cultural invasion will negatively affect local cultural values. After 10+ years the culture will again start recovering.	**Y, Y: -1, 1,2,3** There will be more employment opportunities and household income will increase	Y**, Y: 1, 2, 2, 2** The population is expected to increase due to the decreased rural urban migration. The social services are expected to improve as well.
CLIMATE AND EXTERNAL NATURAL FACTORS	**Y, Y: -1,0,1, 2** Insufficient expertise & rescue equipments in disaster management are national concern. However, with the formation of proper institution, capacity development and implementation the impacts of disaster can be minimized.	**N, Y: -1,-2,-3,-3** With development and industrial growth, climate change induced disaster and impacts will be aggravated.	**Y, Y: 0,0, -1, -1**	**Y, Y: 1,1,2,3** Due to global warming and green house effect chances of GLOF and other related disasters.	**N, Y: 0, -1, -2, -2** Un-predictable climatic conditions due to the disturbance of natural environment.
AGRICULTURE AND	Y**, Y: 1,0,0,1**	**Y, Y: -1, -2,-3,-3**	**Y, Y: 0,2,3,2**	**Y, Y: 1,2,3,3**	**Y, Y: 1,1,2,2,**

LAND	The developmental activities will change the land use pattern in some places. However, with agriculture modernization and land management the production will increase	Agricultural lands will be used for other developmental activities particularly urbanization. As population increases, individual land holdings will be limited.	Agriculture will increase, land availability will decrease.	Pattern of production will change from subsistence to commercial farming. With the coming up of more infrastructures more agricultural land will be lost.	Agriculture would decrease but the production would increase based on the value earned.
LEGAL, REGIONAL AND INTERNATIONAL ISSUES	**Y, Y: 0,-1,?,?** Increasing right to natural resources locally and may be internationally for 5 years will have legal issues after which the issue is unpredictable.	**Y, Y: 2, -1, -1, -1** With the growth of hydropower projects along the Basin II, it is probable that there will be water issues with the neighbouring country who are likely to face water shortage.	**Y, Y: 1,1,2,3**	**Y, Y: 0,1,2, -1** With economic development, the diplomatic relation may grow.	**Y, Y: 1,2,2,2**
SECTOR AND NATIONAL POLICIES, PLANS AND PROJECTS	**Y, Y: 0,1,1,2** Policies, plans & projects will have no immediate impact. However, there will be positive impact with harmonization of conflicting policies.	N**, Y: 3,3,3,3** As population increases, initially there will be exploitation of both natural and cultural assets but eventually laws will be enforced to protect these assets.	**N, Y: 1,1,2,2**	**Y, Y: 0,1,2,2** More democratic and result oriented policies and plans formulated for better development.	**Y, Y: 1,2,2,2**
EXPECTED ENVIRONMENTAL, SOCIAL and ECONOMIC IMPACTS (+/- 1.2.3) ORDER: ENV: SOCIAL: ECON.					
ECONOMIC DEVELOPMENT AND FINANCIAL SERVICES	**1(-1): 2(-1): 3** Environment Economic activities will have negative impact on environment initially but in the long run it will reap positive benefits Social Negative because of displacement leading to social issues but positive due to economic gain (employment, more social services) Economic Immense potential for revenue	**1(-3): 3(-1): 3** - Economic development is inversely proportional to the environment; - Economic development will improve livelihood; - Economic development will increase the Nation's GDP.	**-2(0): 0(+2): 0(+2)** Taken as average impact over 20 years. There is overall negative impact on environment. Socially there is positive benefit. There is positive economic benefit.	**-2(1): 2: 2** As the economy grows, the social life improves with negative impact on the environment	**-2: -1: 3** Due to development activities, there will be environment degradation and social issues however, there are economic benefits.

	generation				
TRANSPORT AND INFRASTRUCTURE (ROADS, BRIDGES ETC)	**-1: 2: 2** Environment All developmental activities will require destruction of the natural environment Social Improve access to services and increase living standard Economic Accessibility and services will promote positive economic development	**1(-3): 3(-1): 3** - It will deteriorate environment; - Will make life easier and comfortable; - It will boost economy.	**-2: 3: 3** Air pollution due to vehicles negatively impacts on environment. Through improved transport connectivity, there is social and economic benefits.	**-2: 2: 2** With the good road network and maximum access, the transportation becomes reliable and comfortable. The increase in automobiles may however increase pollution.	**-2: 3: 3** Main form of linkages
STRATEGIC NFRASTRUCTURE	**-2: 3: 3** Environment All developmental activities will require destruction of the natural environment Social Communities will extremely benefit from the readily available services Economic Enhanced economic growth	**1(-3): 3: 3** - Set up of infrastructure will have negative impact on the environment; - With better facilities in place, it will be better for the people; - It will enhance livelihood.	**-2: 3: 2** Building strategic infrastructure has negative impact on environment. It also brings socio-economic benefits	**-1: 2: 2** People may have access more increased facilities. The construction of these infrastructures may require more space.	**-2(2): 1: 3** There is social and economic benefit but affecting the environment however, environment can be managed with the Environment Management Plan.
TOURISM AND RECREATION	**2(-1): 2(-1): 3** Environment Promote environment protection Social May have changes on behaviour pattern. Create employment opportunities Economic Enhanced economic growth	**2(-1): 1(-1): 2** - It will encourage protection and preservation of environment; - Employment generation is created; - With tourism industry increased, income generation will be also increase.	**-1(1): -1(1): 0(3)** Tourism can have negative impact on env. As well as social. But there is positive economic and social benefit.	**-2(1): 2: 2** For the attraction of the tourists we may have beautifully built recreational areas but they may cause –ve impact on the environment(waste, poaching, health risk). People may have employment opportunities. Inflow of hard currencies.	**-2: -2: 3** Increased tourist activities are a source of income but there are social and environmental issues.
NATURAL ASSETS	**3: 2: 3** Environment	**3: 3: 2(-2)** - Healthy environment;	**-1(0): 0(2): 0(2)** Abundant natural assets has	**-2: 2: 2** Exploitation of natural	**-3(1): 1: 2** Due to economic pressure,

	Promote environment protection. Social Community benefiting from good environment Economic Enhanced economic growth	- People live healthier lives; - Natural resources will be an asset. However, it will be a hindrance to development activities.	benefit both social and economic (NWFP)	resources as raw materials for infrastructure	natural assets are exploited.
CULTURAL ASSETS	**2: 2: 2** Environment Promote environment protection Social United and harmonious society Economic Unique culture draws international attention	**3: 3: 3(-1)** - It will have positive impact; however, it imposes some limitation on the economic development of the country.	**-1(0): 0(2): 0(2)** Some cultural practices have negative effect on environment (wood for prayer-flags). It has high cultural and economic benefit (cultural tourism).	**1: 1(-2): 2** There may be dilution of culture with mixture of different types of people	**1: -1: 2** Cultural dilution
POPULATION, EMPLOYMENT AND SCIAL SERVICES	**-1: -1: 2** Environment Increase in population causes stress on environment Social Population increase puts pressure on job market Economic Positive HR	**(-2): 2(-1): 3(-1)** - With increased population, environment will be affected; - Better living standard but unemployment issues; - Growth in economy but unemployment will have economic implications.	**-2(1): -2(2): 0(1)** More population has negative impact on environment (garbage, solid waste etc), but also offers more employment opportunities.	**-2: 2(-1): 2** With the rise in population, the may be more demand for basic needs. Social problems may arise. With proper social services people may be educated well, live longer and be productive.	**-2: 2: 3** Employment opportunities and generation of national revenue
CLIMATE AND EXTERNAL NATURAL FACTORS	**-2: -2: 1(-2)** Environment Degrading climatic conditions Social Communities vulnerable to hazards (GLOF) Economic Untimely rain affect harvest but climate change enhance cultivation in higher altitude	**(-3): (-3): (-3)** - It has a negative impact on environment, society and economy.	**-3: -1: -1** Climate change is negatively impacting the environment as well as social and economics.	**-1: -2: -2** This may cause huge loss on the infrastructures and lives.	**-3: -1: -3** Threat to economy, social and environment.
AGRICULTURE AND	**-1: 2: 2**	**(-3): 3: 3**	**1(-1): 2: 2(-1)**	**-1: 2: 2**	**-1: 2: 2**

LAND	Environment Land conversion for agricultural purposes Social and Economic Agricultural dependent society	- Limited agricultural land will lead to encroachment of GRF; - It will enhance the economy and livelihood of the local people.	Farming has both positive and negative impacts on environment and economic.	Due to limited availability of land, people may resort to intensive farming, use of chemicals giving rise to environment degradation. People may resort to commercial farming.	There are economic and social benefits.
LEGAL, REGIONAL AND INTERNATIONAL ISSUES	**0: -1: -1** Legal issues hamper economic growth eventually affecting people and environment.	**-: 3: -** - It will affect the relation with the neighbouring countries.	**0: 0: 0** Not much idea	**2: 2: 1** The legal policies and plans may have more aspect towards the environmental conservation. With the increased diplomatic relations, we may be secured.	**2: 1: 1**
SECTOR AND NATIONAL POLICIES, PLANS AND PROJECTS	**3: 3: 3** Critical for achieving GNH	**3: 3: 3** - Based on the situation, plans, policies and projects will be framed.	**1: 1: 1** Not much idea	**1(-1): 2: 2** Sectors plans may be well developed for the socio-economic growth	**2: 3: 3** National Plans and policies made in place for the betterment of the people.
TYPES OF RISK IDENTIFIED BY THE GROUPS (Likely, Unlikely: Y/N. T@0,+5,+10,+20.) Critical uncertainties are signalled and curtail all development options.					
	1. GLOF: Critical uncertainty, the likelihood of happening is high with high damage possibilities. (*Likely)*	**1. GLOF: Likely, Critical Uncertainty**	**1. GLOF: Likely, Critical Uncertainty**. The principal risk factor.	**1. GLOF:** Likely, critical. May hamper economic development.	1**. GLOF**
	2. Flooding – various: Critical uncertainty, the likelihood of happening is high with high damage possibilities. (*Likely)*	**2. Flooding** – various: Likely, Critical.	**2. Flooding** – various. Likely and critical.	**2. Flooding** – various. Likely, critical.	**2. Flooding** – various.
	3. Climate change: Uncertainty, its occurrence will highly impact the population dynamics. (*Likely)*	**3. Climate change:** Likely, Critical	**3. Climate change:** Likely, critical. The country will have to adapt to inevitable climate change	3**. Climate change:** Likely, critical.	3**. Climate change**
	4. Epidemics: Uncertainty, Increase in non-treatable and highly communicable diseases (H1N1, H1N5, HIV). (*Likely)*	**4. Shortage of water:** Likely, critical but manageable.	**4. Geopolitical issues:** Unlikely, not critical. Unlikely that neighbouring countries will go to war.	**4. Geopolitical issues:** Likely, critical. May arise and could hinder economic growth.	**4. Water conflicts**

	5. Political instability: Uncertain as democracy is still in infant stage. (*Likely in international context: Unlikely in National context.)*	**5. Cultural dilution:** Likely, Manageable.	**5. Political uncertainty:** Unlikely, not critical. A stable political system.		**5. Water supply**
	6. Global economic crises: Change in economic dynamics can affect tourism & implementation of developmental activities. (*Likely)*	**6. Loss of Agric. Land:** Likely, critical			**6. Change of Plans/Policies of the Government**
	7. National security: Uncertainty due to geographical location. (*Likely)*	**7. Loss of Natural Assets:** Likely, manageable			7. Global economic financial risk
	8. Water conflicts: Uncertain, Globally predicted due to population increase and climate change. (*Likely)*	**8. Rural/urban migration:** Likely, manageable.			8.Geopolitical issues/diplomatic relations

ISSUES IDENTIFIED AND COMMON TO ALL GROUPS

Sl. No.	Theme/Topic	Sl. No.		Sl. No.	Theme/Topic
1	**Economic Development Opportunities** a. Domestic & Foreign trade b. Industrial development c. Tourism Activities d. Mining activities e. Agriculture & livestock activities f. Small, Medium Enterprise **g.** Private Sector Development	**2**	**Strategic Infrastructure** a. Education Facilities b. Health Facilities c. Telecommunication Facilities d. Power transmissions e. Road constructions f. Bridge construction g. Surface Transport Development h. Airports & helipads i. Urbanization j. Financial Institutions **k.** Early Warning System	**3**	**Social Services** a. Education Services b. Health Services c. Drinking Water Supply Scheme d. Employment Opportunities e. Financial Services f. Courier and Postal Services g. Waste treatment and Disposal h. Public Transport Services
4	**Natural ersity**	**5**	**Climatic Issues & Risks** a. GLOF	**6**	**Law and Order** a. Trans-boundary issues

	a. Biodiversity, flora-fauna -Forest resources -Aquatic fauna -Watershed/water bodies management -Land management b. Creation of buffer zones		b. Early melting of glacial c. Rainfall Vs Vegetation Growth d. Monsoon Vs Land Degradation		b. Security c. Cultural & traditions d. Immigration (with reference to foreign workers)
7	**Humanitarian/Social** a. Displacement & stress b. Resettlement Vs Settling c. Migration Vs over d. Youth & Employment e. Youth & anti social issue f. Urban Poverty g. Population growth Vs Scarcity of Resources h. Modernization Vs Culture & Traditions i. Health (diseases) j. Human wild-life conflicts k. Gender issues l. Gap between rich & poor	8	**Enabling Environment** a. Capacity development of Local Governance b. Disaster management in place c. Policies and programmes formulation d. Appropriate laws, rules and regulations in place e. Effective implementation	9	**Poverty & Environment** a. Poverty & Environment b. Changing land use pattern (urbanization) c. Food security d. Poverty & health e. Rural livelihood f. Uneven income distribution g. Education & Poverty
OBJECTIVE OF THE STRATEGIC ASSESSMENT PROPOSED BY PARTICIPANTS					
PROCESS OBJECTIVE	**"To analyse through relevant stakeholder and public participation, a number of alternative development scenarios expected from investments in Projects on Basin II to enable the selection of optimal solutions delivering maximum sustainable (GNH) benefits o Bhutan while minimizing the cumulative impacts of that development".**				

TOPICS and THEME SUB-OBJECTIVES SELECTED BY PARTICIPANTS	
Climate Change	Development planning and associated investments in the area of influence of Basin-2 hydropower investments are directed and planned taking into consideration risks and cumulative impacts expected from climate change and systematically introducing mitigation and management measures.
Watersheds /Catchment Basins	Catchment basins and water supplies are mapped, inventoried and effectively managed to ensure continued delivery of critical ecosystem services to downstream users and the State.
Economic Development	Economic and urban development of Dzongkhags and Geogs directly affected by investment in Basin-2 hydropower developments is planned, coherent, sustainable and, as such, does not impact negatively on the population, the environment and conserves inter-generational equity.
Tourism – Eco-tourism – Tourism Services	Development of tourism assets and opportunities in the area of influence of Basin-2 hydropower developments are identified, zoned, promoted, developed sustainably and contribute to national, regional and local development plans (within the principles of GNH).
Environment: **- *Pollution control*** **- *Waste Management*** **- *Water Management*** **- *Biodiversity*** **- *Natural Assets***	Investments and developments in the Basin-2 area are integrated into the natural environment / Landscape by giving a high priority on the quality and limitations of ecosystems in the area of influence and minimizing negative environmental impacts. Biodiversity inventoried in the area of influence of planned Basin-2 hydropower investments is enhanced and actions leading to irreversible losses are prevented.
Social Infrastructure	Improving the livelihood of the people by providing better heath services, education, employment opportunities, recreational facilities, better communication and financial services.
Agriculture/Forests	Ensure minimum loss of agricultural land and Government Reserve Forest lands while ensuring an adequate supply of land for all future demand as per the relevant laws of the Kingdom.

Culture and Heritage	**A.** Cultural heritage values and sites are protected and promoted as social, historical and economic assets. **B.** Cultural heritage and cultural fabric in the areas of influence is not affected by the development and migration/displacement have minimum negative impacts
Security	Measures to enhance existing security relationships with neighbour states to ensure that security risks do not erode economic/social development options and potential.

12.6 ANNEX-6: PROCESS ACTION PLAN

PROCESS ACTION PLAN					
ACTION		**TIMING**	**PARTICIPANTS**	**RESPONSIBILITY**	**STATUS**
1	Introduction of the SEA Process to Key Stakeholders and Process Partners: NEC, NLC, GNHC and Dzongkhag Environment Officers.	May – June 2009.	• June 3 - NLC • June 9 –NLC NECS, GNHC. • June 12 NECS, DEO's.	NECS - Management and staff; Danida Process Advisor; Liaison Office Denmark.	**COMPLETED**
2	Agreement on Strategic Assessments to be carried (Sectors or Development Actions) out according to following criteria: • Based on priorities defined in the 10th FYP; • Complex or mega-projects likely to have significant wider development impacts; • Predicted Environment, Social and Economic impacts requiring management and mitigation;	May – June 2009	Gross National Happiness Commission; National Environment Commission; National Land Commission	NECS – GNHC – NLC – Process Advisor	**COMPLETED**
3	Process Planning and Budgeting	June 8-24,2009	NECS	Tshewang Chaskar – Process Advisor	**COMPLETED**
4	Site visit to Wangdue-Phodrang to locate venues for Basin-2 Workshops.	June 23,2009	NECS	Tshewang Chaskar – Process Advisor	**COMPLETED**
5	Preliminary agreement on proposed plan and budget	June 25,2009	LOD-NECS	H.E. Deputy Minister - NECS	**COMPLETED**

				Director General – NECS Liaison Office Denmark.	
6	Finalisation of Process Description, Plan and Budget (The Planning Document)	June 26, 2009	NECS	Tshewang Chaskar – Process Advisor	**COMPLETED**
7	Delivery of the Planning document to the Liaison Office Denmark for Endorsement	June 29, 2009	NECS	H.E. Deputy Minister - NECS Director General – NECS	**COMPLETED**
8	Departure of the Short-Term Advisor.	June 30, 2009	n.a.	n.a.	**n.a.**
9	Delivery of the Planning Document to GNHC for approval and release of funds	June 30,2009	NECS	Director General – NECS	**COMPLETED** **Funds released August 2009**
10	Planning and logistics necessary to process preparation	July 2009	NECS-GNHC-NLC-DEO's	Director General - NECS	**COMPLETED**
11	Preparation of site visits Basin-2 projects: • Number of NECS participants - 3,4; • DEO's informed to be available; • Letters to Dzongdags informing of the visit and requesting a scheduled meeting with Dzongkhag officers. • Hydro-engineers informed and meetings arranged; • Hotel reservations	July 2009	NECS – DEO's – GNHC	Director General – NECS Thinley Dorji – NECS Dzongkhag Environment Officers	**COMPLETED**

	• Transport and logistics arranged; • Visit to include hydropower sites and an overview of the area of influence.				
12	Preparation of site visits – Dhamdum Industrial Estate projects: • Number of NECS participants - 3,4; • DEO's informed to be available; • Letters to Dzongkdags informing of the visit and requesting a scheduled meeting with Dzongkhag officers. • Department of Industry informed and meetings arranged; • Hotel reservations • Transport and logistics arranged; • Visit to include Industrial Estates and an overview of the area of influence.	July 2009	NECS – DEO's - GNHC	Director General – NECS Tenzin Khorloo – NECS Dzongkhag Environment Officers	**COMPLETED**
13	Arrival of the Short-Term Advisor	August 4,2009	n.a.	n.a.	**n.a.**
14	Briefing at NEC to discuss status and progress of SA arrangements	August 5-7, 2009	NECS	NECS staff and Process Advisor	**COMPLETED**
15	Scoping Mission: Basin-2 Projects • Bilateral stakeholder discussions (Dzongkhags and project officers); • Site Visits to Area of influence and the proposed focus area; • Presentation of the SA process and	August 11-15, 2009	NECS officers – DEO's – Dzongkhag Administrations – Process Advisor – Hydropower engineers – Department of Energy	NECS – Process Advisor and Dzongkhag Environment Officers from the area of influence.	**COMPLETED**

	procedures; • Preliminary definition of SEA Process Objectives; • Preliminary definition of SEA Process Framework (Spatial and Temporal) • Mission Report to document progress, constraints and detail next steps.				
16	Scoping Mission: Dhamdum Industrial Estate • Bilateral stakeholder discussions (Dzongkhags and project officers); • Site Visits to Area of influence and the proposed focus area; • Presentation of the SA process and procedures; • Preliminary definition of SEA Process Objectives; • Preliminary definition of SEA Process Framework (Spatial and Temporal) Mission Report to document progress, constraints and detail next steps.	August 18-22, 2009	NECS officers – DEO's – Dzongkhag Administrations – Process Advisor – Industrial Estate planners – Department of Industry.	NECS – Process Advisor and Dzongkhag Environment Officers from the area of influence.	**COMPLETED**
17	Letters of Invitation to workshop participants	August 15	NECS	H.E. Deputy Minister - NECS Director General – NECS	**COMPLETED**
18	Preparation workshop materials:	August 25-28 2009	NECS – GNHC - NLC	Process Advisor	**COMPLETED**

	• Workshop agenda • PowerPoint presentations; • Forms; • Scenario Forms; • Participant Folders and stationary; • Confirm logistics. • Dry run to NECS staff participating in the Workshops.			Mr. Tshering Tashi Mr. K.C. Nyedrup Mr. Thinley Dorji Mr. Tshewang Chaskar Ms. Tshewang Zangmo	
19	Workshop – 1: Basin-2 Hydropower Projects. *Venue – Wangdue-Phodrang* • Introduction to SEA/SA and workshop format; • Agreement on the Process Framework (Spatial and Temporal); • Definition and agreement on Process Objective and Sub-objectives; • Compilation of available information collected and brought to the venue by participants; • Introduction to Scenario construction; • Identification of scenarios; • Introduction to forecasting; • Introduction to Analytical techniques, examples and selection of preferred options; • Linkages; environmental and socio-	August 31 – September 5 2009	NECS- GNHC - NLC	H.E. Deputy Minister – NECS. Director General – NECS. Mr. Tshering Tashi Mr. K.C. Nyedrup Mr. Thinley Dorji Mr. Tshewang Chaskar	**COMPLETED (58 participants)**

	economic effects; • Demonstration of the use of Impact matrices; • Construction and discussion of "zero" option scenarios. • Construction of T+5,10,15,20 scenarios • Identification of information needs and availability.				
20	Compilation of information and results of Workshop-1 Basin-2 developments. Discussions in NECS to study the process and introduce adjustments as necessary prior to Workshop-2 Basin-2 developments and Workshop-1 Dhamdum.	September 7-11, 2009	NECS – Thimphu	Process Advisor Mr. Tshering Tashi Mr. K.C. Nyedrup Mr. Thinley Dorji Mr. Tshewang Chaskar Ms. Tshewang Zangmo	**COMPLETED**
21	Workshop – 1: Dhamdum Industrial Estate Projects. *Venue - Paro* • Introduction to SEA/SA and workshop format; • Agreement on the Process Framework (Spatial and Temporal); • Definition and agreement on Process Objective and Sub-objectives; • Compilation of available information collected and brought to the venue by participants; • Introduction to Scenario	September 14-19, 2009	NECS- GNHC - NLC	H.E. Deputy Minister – NECS. Director General – NECS. Mr. Tshering Tashi Mr. K.C. Nyedrup Mr. Tenzin Khorloo. Mr. Tshewang Chaskar. Ms. Tshewang Zangmo	**COMPLETED** **(53 participants)**

	construction; • Identification of scenarios; • Introduction to forecasting; • Introduction to Analytical techniques, examples and selection of preferred options; • Linkages; environmental and socio-economic effects; • Demonstration of the use of Impact matrices; • Construction and discussion of "zero" option scenarios. • Construction of T+5,10,15,20 scenarios • Identification of information needs and				
22	Compilation of information and results of Workshop-1 Dhamdum Industrial Estate. Discussions in NECS to study the process and introduce adjustments as necessary prior to Workshop-2 (Dhamdum and Basin-2 hydro projects).	September 21-23 and 25 2009	NECS – Thimphu	Process Advisor Mr. Tshering Tashi Mr. K.C. Nyedrup Mr. Tenzin Khorloo Mr. Tshewang Chaskar Ms. Tshewang Zangmo	**COMPLETED**
23	Data and information gathering to establish baselines critical to the process and to future monitoring. Information will be collected from: Stakeholders; Statistics; Census; Institutions; Associations; NGO's;	October 1-25 2009	NECS – GNHC – NLC – Sectors – Stakeholders – Dzongkhags – and others.	NECS staff; GNHC; NLC; DEO's	**IN PROGRESS**

	Cooperating Partners; and all other sources identified.				
24	Progress Report to the joint GNHC-NEC Commission	October 26-30 2009	NECS	H.E. Deputy Minister – NECS. Director General – NECS. Process Advisor Mr. Tshering Tashi Mr. Thinley Dorji Mr. Tenzin Khorlo Ms. Tshewang Zangmo Mr. K.C. Nyedrup	**REPORT SUBMITTED AND BUDGET RELEASED**
25	Letters of Invitation to workshop participants	October 26 -30 2009	NECS	H.E. Deputy Minister - NECS Director General – NECS	**COMPLETED**
26	Drafting of Strategic Assessment Reports (Basin-2 hydropower and Dhamdum Industrial Estate): • Agree on Report format; • Agree on the Table of contents; • Draft background sections; • Draft Methods Section • Draft section detailing the environmental, social and economic framework and baseline.	November 2-13 2009	NECS-GNHC -NLC	GNHC – NLC – NEC Staff Director General – NECS. Mr. Tshering Tashi Process Advisor Mr. Thinley Dorji Mr. Tenzin Khorloo Ms. Tshewang Zangmo Mr. K.C. Nyedrup	**COMPLETED**
27	Preparation of materials for the 2nd Basin-2 and Dhamdum Workshops:	November 2-13 2009	NECS – GNHC - NLC	Process Advisor Mr. K.C. Nyedrup	**COMPLETED**

	• Workshop agenda • PowerPoint presentations; • Forms; • Scenario Forms; • Participant Folders and stationary; • Confirm logistics.			Mr. Thinley Dorji Mr. Tenzin Khorlo Mr. Tshewang Chaskar Ms. Tshewang Zangmo	
28	Workshop – 2: Dhamdum Industrial Estate Projects. *Venue – to be decided.* • Analysis of Scenarios; • Projected land-use and land demand in the area of influence and the focus area; • Identify conflicts and incompatibilities relative to the scenarios; • Identify Risk Areas relative to the scenarios • Identification of development alternatives; • Identification of options and opportunities; • Impact assessments and mitigating measures (point source and cumulative); • Selection of preferred option and alternative choices; • Full Description of preferred option, mitigating measures,	November 16-20, 2009	NECS- GNHC - NLC	H.E. Deputy Minister – NECS. Director General – NECS. Mr. Tshering Tashi Mr. K.C. Nyedrup Mr. Tenzin Khorloo. Mr. Tshewang Chaskar. Ms. Tshewang Zangmo Process Advisor	**COMPLETED**

	enhancement of opportunities; • Compilation of Results				
29	Workshop – 2: Basin-2 Hydropower Projects. *Venue –to be decided.* Analysis of Scenarios; • Projected land-use and land demand in the area of influence and the focus area; • Identify conflicts and incompatibilities relative to the scenarios; • Identify Risk Areas relative to the scenarios • Identification of development alternatives; • Identification of options and opportunities; • Impact assessments and mitigating measures (point source and cumulative); • Selection of preferred option and alternative choices; • Full Description of preferred option, mitigating measures, enhancement of opportunities; • Compilation of Results	November 23-28, 2009	NECS- GNHC - NLC	H.E. Deputy Minister – NECS. Director General – NECS. Mr. Tshering Tashi Mr. K.C. Nyedrup Mr. Thinley Dorji Mr. Tshewang Chaskar Process Advisor	**SCHEDULED AS PLANNED**
30	Preparation of Draft SEA/SA Report for Basin-2 Hydropower Projects	December 1-18, 2009 (Tentative dates)	NECS-GNHC- NLC –Process Advisor	NECS Staff Process Advisor	**THIS REPORT**
31	Preparation of Draft SEA/SA Report	December	NECS-GNHC- NLC –Process	NECS Staff	**DRAFT REPORT**

	for the Dhamdum Industrial Estate Projects	1-18, 2009 (Tentative dates)	Advisor	Process Advisor	**PREPARED**
32	Process Advisor Departs Bhutan	December 19, 2009	n.a.	n.a.	**n.a.**
33	Disseminate Draft SA Reports to Stakeholders for Comments and adjustment	January 2010	GNHC-NECS – DzEO's	GNHC – NLC – NEC Staff H.E. Deputy Minister – NECS. Director General – NECS. Mr. Tshering Tashi Mr. K.C. Nyedrup Mr. Thinley Dorji Mr. Tenzin Khorloo Ms. Tshewang Zangmo	**SCHEDULED AS PLANNED**
34	Prepare *Final Draft* SEA/SA Reports incorporating stakeholder comments.	January 2010	NECS-GNHC- NLC – Process Advisor	NECS Staff Process Advisor	**SCHEDULED AS PLANNED**
35	Circulate Draft Report to key Stakeholders and the Private Sector in preparation of a National Consultation Workshop	January-February 2010	NECS - DzEO	NECS, GNHC Staff	**SCHEDULED AS PLANNED**
36	Prepare the Natiional Consultation Workshop: - Draw up lists of participants - Select and secure a venue - Send invitations	March 2010	NECS-GNHC-NLC	NECS, GNHC Staff	**SCHEDULED AS PLANNED**

37	Adjust Draft Reports following outcomes and comments of the National Consultation Workshop.	March 2010		NECS Staff Process Advisor	**SCHEDULED AS PLANNED**
38	Submit SEA/SA Report to joint GNHC-NEC-NLC Commission members.	March 2010	GNHC-NEC -NLC	H.E. Deputy Minister – NECS. Director General – NECS Mr. K.C. Nyedrup	**SCHEDULED AS PLANNED**
39	Joint GNHC-NEC-NLC Commission meeting at a venue to be decided to present the findings for comments and endorsement.	April 2010	GNHC – NEC – NLC	H.E. Deputy Minister – NECS. Director General – NECS. Mr. Tshering Tashi Mr. K.C. Nyedrup Mr. Thinley Dorji Mr. Tenzin Khorlo Ms. Tshewang Zangmo Process Advisor	**SCHEDULED AS PLANNED**
40	Adjust Report following comments of the Joint Commission	April 2010	NECS-GNHC- NLC – Process Advisor	NECS Staff Process Advisor	**SCHEDULED AS PLANNED**
41	Draft Record of Decision on behalf of the joint GNHC-NEC-NLC Commission as per their specific instructions.	April 2010	GNHC - NECS	H.E. Deputy Minister – NECS. Director General – NECS. Mr. K.C. Nyedrup Mr. Thinley Dorji Mr. Tenzin Khorlo Ms. Tshewang	**SCHEDULED AS PLANNED**

				Zangmo Process Advisor	
42	Prepare a first Draft of an SEA/SA Process implementation manual.	March-April 2010	NECS	NECS Staff Process Advisor	**DRAFT IN PROGRESS**