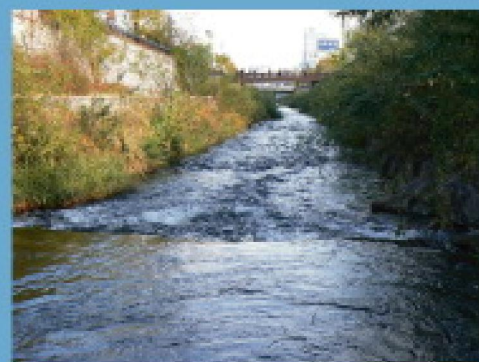
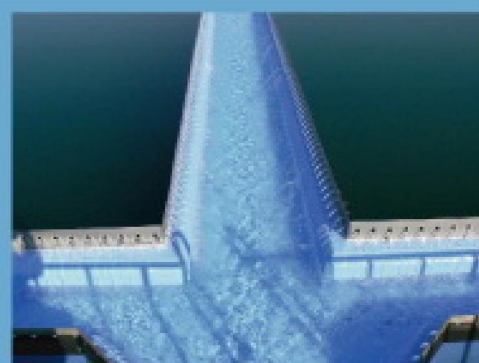


Strategy for Eco-efficient Water Infrastructure Development in Bhutan



June 2011



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February, 2011

Department of Urban Development and Engineering Services

Ministry of Works & Human Settlement
&

National Environment Commission Secretariat

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1. INTRODUCTION

1.1 Background

The Royal Government of Bhutan (RGoB) has made remarkable progress in human resources as well as economic development since the start of the planned development in the early 1960s. The development philosophy of the RGoB is “Gross National Happiness” and one of its cornerstones is advocacy of “middle path” development maintaining harmony between socio-economic progress and environmental conservation.

With the current growth rate of 1.3%, population will double in next fifty years. The growth of urban population is somewhat alarming and it is estimated that by 2020, 50 percent of the population would reside in urban areas. The rapid urbanization would place higher demand on water and a greater pressure on the environment.

Eco efficient approaches inspire the shift of water development paradigm through the balance between physical water infrastructure (multipurpose dams, pipes etc.) and non-physical water infrastructures (Legislations, metering, pricing, awareness & advocacy, demand management, planning based on water cycle etc.).

Eco efficient approach is one of the best ways to address the dual goals of meeting human water demands and ensuring aquatic ecosystem— which are the foundations of long term water security.

In this context, the Strategy is developed to help address some of the challenges in water sector such as drinking water shortage & sanitation, agriculture, drying out and reducing water yield, and conservation/ protection of watershed.

1.2 Eco-efficient Water Infrastructure

1.2.1 Basic concept of eco-efficiency

The term, ‘eco’ in this strategy means both economical efficiency and ecological efficiency (E/E). According to the World Business Council for Sustainable Development (WBCSD), eco-efficiency can be defined as ‘the delivery of competitively priced goods and services that satisfy human needs and improve quality of life, while progressively reducing ecological impact and resource intensity throughout the life cycle to a level at least in the line with the earth’s carrying capacity’ (WBCSD, 2000). This definition implies that E/E can bring about more added values with less environmental impacts.

The fundamental nature of eco-efficiency has three characteristics: collaboration, integration, and sharing of information between stakeholders. This idea is directly linked with monitoring; life cycle and the principles of 3Rs (Reduce, Reuse, and Recycle).

1.2.2 Key components of eco-efficient approaches in water infrastructure

The application of eco-efficiency requires methods and approaches of integrated planning which will be different from the traditional methods. Eco efficient approaches requires policy

makers to consider the plans and designs based on water cycle, water infrastructure life cycle operation and maintenance of water infrastructure and the surrounding eco-system.

Application of eco efficiency into water infrastructure development needs to integrate both dimensions of physical infrastructure aspects and non-physical or institutional aspects such as laws, regulations, regulatory programs, government bureaus, and civil society organizations. The eco-efficient water infrastructure includes institutional arrangements and policy measures like relevant legal, economic and regulatory instruments.

Another component of eco-efficiency in water infrastructure is to strengthen and integrate approaches to water management issues. Fragmented approaches to water management issues had been criticized and blamed as one of the primary causes for inefficient water resources development and management.

Decentralized approach is seen as crucial for promotion of ecoefficiency in water infrastructure development. The decentralization in the water sector tantamount to devolution of the managerial, administrative, and financial power to local authorities. They should be encouraged to promote developmental policies and strategies appropriate for local conditions -social, economic and environment. Decentralization can accelerate streamlining of the governmental bureaus at the center and redefine the roles and functions of diverse bureaus related to water management.

1.2.3 Need for eco-efficient approaches

The science of eco-efficiency is a relatively new concept in the region. Integrating new development concept into existing institutional frameworks can be sometimes challenging. This requires not only new thinking and mindsets, but also long-term development plan with mid-term action plans along with capacity building, appropriate infrastructure provision, adequate budget allocation and public investment.

1.2.4 Expected benefits and constraints of eco-efficient approaches

The benefits:

- Policy planning perspectives
 - Eco efficient approach will be practical in making policies towards sustainable water management and development.
 - Prioritized actions can use eco efficient approaches to guide and expedite the achievement of the set targets.
 - Constraints and risks are identified and managed appropriately including financial, environmental, social and governance risks relating to water infrastructure, during planning, design, operation and maintenance.

- Economic perspective
 - Reduce the need to construct additional water supply facilities such as dams and reservoirs
 - Integrated planning for water facilities construction can curtail duplication of activities in the same areas and sectors
 - Reduce the costs of treating water through eco efficient management of existing water infrastructures
 - Enhance the sustainability of water infrastructure

- Environmental perspective
 - Ecosystems will be more resilient in an environment that is less disturbed
 - Improved environmental conditions with natural waterways will be more conducive to increased native biodiversity
 - Improved hydrological balance by using natural processes of storage, infiltration and evaporation
 - Improved water quality creating habitats conducive for biodiversity growth
 - Able to withstand the impacts of climate change such as flooding

Likely constraints:

- Government officials and decision makers may be skeptical to accept the new concept
- Integration of eco-efficiency into development planning process requires concerted efforts over a fairly long period of time
- Improper management system may limit the successful integration of the eco efficiency
- Public may find the concept cumbersome and bureaucratic in the beginning, so extensive awareness and advocacy may be required
- Limited capacity to implement eco-efficient approach

1.3 Objective of the strategy

- To integrate eco-efficiency concept into water resources development.
- To promote eco-efficient water infrastructure dimensions into planning, implementation, monitoring and evaluation of water infrastructure development

2. EXISTING AND PERSISTENT ISSUES OF WATER INFRASTRUCTURE

(1) Some of the key challenges in water supply sector are water shortages for drinking & sanitation and agricultural purposes. The recent phenomenon of the drying up of streams and dwindling water sources has posed additional challenge.

(2) Increasing demand for timber, firewood and non-timber forest production is starting to have negative impacts on watershed. This in turn will affect the sources of drinking water, irrigation and hydropower.

(3) Uneven distribution and intensity of precipitation over the fragile mountainous environment causes landslides, flood and droughts.

(4) Rapid urbanization and industrialization will put pressure on water through increased demand in terms of quantity and the associated water pollution due to discharge of more waste water.

(5) The water demand for agriculture is also expected to increase due to agriculture intensification to keep pace with increased food demand of a growing population.

(6) The growth of urban population will generate increasing volume of wastewater. Use of eco-efficient approach could help in reducing the waste water volume.

(7) Decrease of water quantity during winter coupled with increasing sediment load in rivers during monsoon causes reduction in the hydropower generation. Hydropower is the mainstay of the country's economy, accounting for about 45% of government revenue.

(8) Glacial Lake Outburst Floods (GLOFs) are the major threat to the life and property. The 1994 GLOF that spelled disaster in the Punakha valley causing huge damages to infrastructure and loss of lives was caused by the breach of Lugge glacial lake in the upstream Lunana.

(9) The existing water user institutions have weak functional linkages at policy, planning and programming levels, which has resulted in fragmented data, duplication of efforts and poor resource management system.

(10) There is urgent need to improve the operation and maintenance skill of the managers and technicians of the municipal corporations managing water supply in the towns. The capacity building and increasing the numbers of professionals at all levels need immediate attention.

3. LEGAL AND INSTITUTIONAL FRAMEWORK OF WATER RESOURCES MANAGEMENT

3.1 Legal Framework

1. The Constitution of Bhutan in its Article 5 recognizes every individual as the trustee and responsible for safeguarding the natural resources and the environment. Environment is also one of the four pillars of the Gross National Happiness.
2. The Bhutan Water Policy is endorsed by Parliament in 2007. The Policy has very clear water vision which states "Water is most important natural, economic and life sustaining resource and we must ensure that it is available in abundance to meet the increasing demands. Present and future generations will have assured access to adequate, safe and affordable water to maintain and enhance the quality of their lives and the integrity of the natural ecosystems."

The policy advocates the following broad principles:

- Water users interests and priorities, water for drinking and sanitation as 1st priority
 - Principles for water resources development and management - IWRM approach based on river basins.
 - Institutional development for water resources management – independent authority is proposed.
 - International waters.
3. The Water Bill was discussed during the summer session of the National Assembly in June 2010. With minor changes it was passed as an Act. The National Council discussed this Bill during the winter session of 2010. Seeing water as one of the most important natural resources, the hon'ble members felt the need of an independent and reliable Agency to steer the water resources management. During June-July

2011 Parliament session, the joint session will decide the need of a higher water authority and is expected to pass the legislation as Water Act 2011 with minimal amendment to other provisions. With the enactment of the Water Act, this will provide a legal basis for the implementation of the different provisions related to water in other legislations. Water related provisions in other Acts such as Land Act 1979, Forest and Nature Conservation Act 1995, Bhutan Electricity Act 2001 and Water and Sanitation Rules will be harmonized with the provisions of the new Water Act.

3.2 Institutional Framework

3.2.1 Institutions related to water resources

- a) The **National Environment Commission (NEC)**: NEC is an independent authority and the highest decision making body on all matters relating to water resources. The NEC shall ensure effective coordination of eco-efficient water infrastructure as a part of water resources management at the national level.
- b) The **Ministry of Works and Human Settlement** and municipal bodies for ensuring safe, adequate and potable water supply in the Throms and Thromdes. Formulate policies and develop plans related to physical infrastructures related to eco-efficient water in the country;
- c) The **Dzongkhag Tshogdu and Gewog Tshogde** supported by the Dzongkhag, Dungkhag and Gewog Administration in collaboration with the Ministry of Health for ensuring safe, adequate and potable water supply at Dzongkhag, Dungkhag and Gewog level not covered under (b).
- d) The **Ministry of Health** for monitoring water quality both in urban and rural areas.
- e) The **Ministry of Agriculture**, for land-use and irrigation, watershed management, water resources in forests, wetlands and protection of catchment areas.
- f) The **Ministry of Economic Affairs** for collection, analyses and dissemination of water resources data and monitoring of water flows including discharge level and sediment for the purposes of the National Integrated Water Resources Management Plan, planning and design of water resource infrastructure including dams and GLOF issues.
- g) **Bhutan Electricity Authority** for hydropower generation and other related activities as per the Electricity Act of Bhutan.
- h) The **Ministry of Home and Cultural Affairs** for coordination of disaster preparedness and mitigation related to water.

- i) The **Ministry of Education** for sensitizing, creating awareness on water resources issues through schools and institutions
- j) **Civil society organizations** and the media for assisting in prevention of water pollution and sustainable use of water resources through education, public awareness and promoting public-private partnership.

4. INTEGRATION OF ECO-EFFICIENT WATER INFRASTRUCTURE INTO WATER RESOURCES DEVELOPMENT

The strategy for strengthening institutional framework for eco-efficient water infrastructure development shall consist of at least the following four key elements:

- (1) initiating the consultation process with key stakeholders;
- (2) priority programmes to apply eco-efficient dimensions into water infrastructure development process;
- (3) coordination and monitoring mechanism of pilot activities and programmes; and
- (4) development of institutional and legal framework to sustain the process.

Some of the details are elaborated below:

- Initiate the process with stakeholders’ workshop (representatives of water related ministries and local governments) to enhance the awareness of the eco efficient approaches, and to identify opportunities and barriers in the adoption of eco efficiency
- Establish the inter-ministerial task force to initiate the process
- Initiate internal discussions among relevant ministries and local governments to identify opportunities and barriers
- Develop necessary policy, strategy, frameworks and supporting guidelines
- Identify the priority area/sector programmes of local governments for practical actions through seminars and workshops to link eco efficiency dimensions
- Facilitate key stakeholders in adopting the concept of eco-efficiency and to link with their existing water development programmes

4.1 Framework for the Promotion of Eco-efficient Water Infrastructure

National Water Vision	Water is the most important natural, economic and life-sustaining resource and we must ensure that it is available in abundance to meet the increasing demands. Present and future generations will have assured access to adequate, safe and affordable water to maintain and enhance the quality of their lives and the integrity of natural ecosystems
Strategies	<ol style="list-style-type: none"> 1. To Extend /improve water supply to urban and rural areas 2. To enhance Eco-efficiency 3. To strengthen the legal/ institutional frameworks 4. To build capacity of the water professionals
Principles	<ol style="list-style-type: none"> 1. Environment Conservation 2. Integrated Water Resource Management 3. Sustainable Use of Water Resources 4. Economic Efficiency

	5. Equity and Good Governance
Challenges and Actions	<ol style="list-style-type: none"> 1. Strengthening the capacity of NEC to coordinate water resources management 2. Implement IWRM for holistic water resources management 3. Develop water resources inventory and conduct research/ studies on emerging issues such as ; drying out of water sources, reduced yield in rivers and streams, water use and water quality mapping 4. Develop water standards – drinking water, minimum environmental flow, discharge standards

5. PROGRAMMES FOR PRIORITY ACTIONS

5.1 Principles for Actions

5.1.1 Guiding Principles

- Objectives of the eco efficiency should complement the vision of Gross National Happiness
- Implementation of eco efficiency should be through the existing institutional framework on water
- Action plans with measurable objectives/targets should be designed based on prioritized issues

5.1.2 Specific Guidelines

- Shift of development paradigm: Apply eco efficiency dimensions in decision making process, planning, monitoring and evaluation for water infrastructure development
- Integrated planning of water resources with other infrastructures such as water supply, sanitation, tourism, fishery, hydropower, irrigation, at the river basin level
- Decentralized approaches for water infrastructure together with allocation of resource and capacity buildings to local governments/stakeholders
- Easy participatory mechanism for active participation and ownership for local stakeholders.
- Strategic planning based on water cycle and life cycle should be promoted

5.2 Advocacy and awareness

- National advocacy workshop on strategy on eco efficient water infrastructure development.
- Awareness and advocacy on the eco-efficiency to inject a new dimension into water related activities to make it more efficient and sustainable.

5.3 Capacity-building

Capacity building programmes are required in the following areas:

- Data collection and analysis
- Integrated cross-sectoral planning
- Assessment of National Water resources
- Surface water source and watershed protection
- Ground water hydrology and recharge
- Rain water harvesting

- Operation and management of existing water infrastructure
- Water balance study
- Crop water requirement and cropping systems
- Soil erosion and bio-engineering
- Recycling and reuse
- Development of strategic planning guideline and technical supporting guidelines
- Demand Management including the pricing

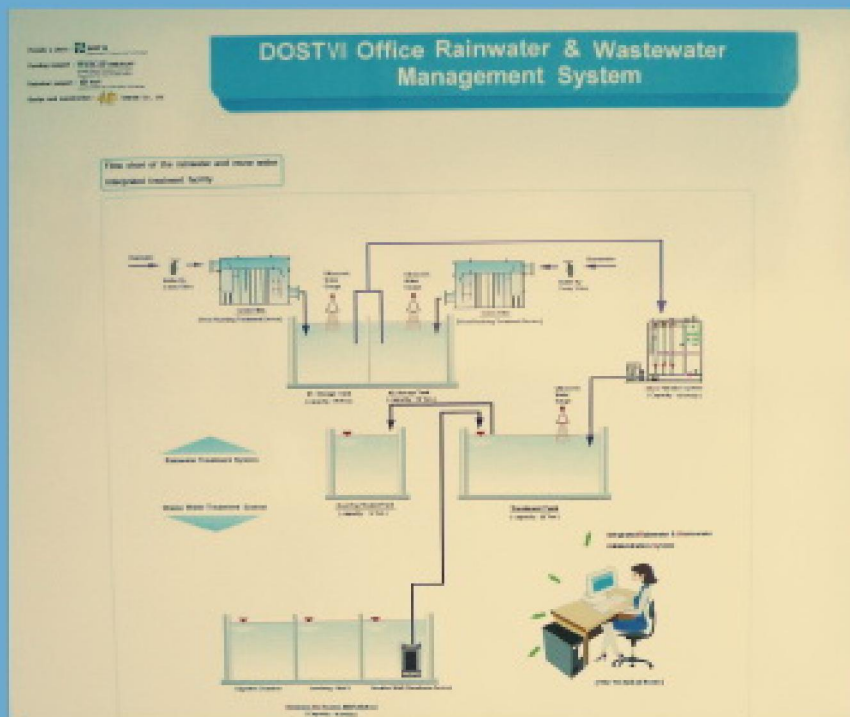
5.4 Pilot Projects where eco efficient concept can be incorporated

- Water policy-based Priority Programmes
 - ✓ Integrate Eco-efficiency concept into existing guidelines (Environment Assessment sectoral guidelines)
- Water sector-based Priority Programmes
 - ✓ Project on Thimphu Water Supply Master Plan supported by ADB
 - ✓ Development of Water Sensitive Urban Design (WSUD): Guidelines (Planning and Technical)
 - ✓ Begana mini-hydropower project to be integrated with Eco-efficiency concept
 - ✓ Incorporating the eco-efficiency in the rules and regulations under the Water Act
- Region-based Priority Programmes
 - ✓ Integrated rainwater harvesting project with sanitation measures

6. RECOMMENDATIONS

The following recommendations are proposed:

1. Strengthen NEC to play a key role in promoting eco-efficient water infrastructure
2. Inculcate common understanding on eco-efficient approach and its benefits among stakeholders
3. Strengthen the existing coordinating mechanism among stakeholders
4. Enhance the advocacy and awareness on the eco efficient approaches
5. Strengthen the database management and monitoring system
6. Involve stakeholders to translate strategy into actions
7. Strengthen legal and institutional frameworks
8. Identify the human resource gap (Training need assessment)
9. Ensure integration of eco-efficiency in all planning processes
10. Identify opportunities and barriers in the adoption of eco-efficiency approaches



Discussion Paper



United Nations
 Economic and Social Commission for Asia and the Pacific
 Environment and Development Division
 United Nations Building, Rajadamnern Nok Avenue
 Bangkok 10200, Thailand
 Tel: +66 2 2881533
 Fax: +66 2 2881059; 1048
 E-mail: escap-esdd-sudu@un.org
 Website: <http://www.unescap.org/>
<http://www.ecowaterinfra.org>