

**DISCOURSE, LEGISLATIVE FRAMEWORK AND PRACTICE ON INTEGRATED  
WATER RESOURCES MANAGEMENT IN BHUTAN**

**Second Draft**

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## DISCOURSE, LEGISLATIVE FRAMEWORK AND PRACTICE ON INTEGRATED WATER RESOURCES MANAGEMENT IN BHUTAN

### ***EXECUTIVE SUMMARY***

Bhutan is a tiny country in the eastern Himalayas with a total area of 47,000 sq. km and conservative estimates of population of 600,000. The major natural resource endowment of the country is its forest cover spread over approximately 72% of the area of the country. Bhutan has also been endowed with abundant water resources with its major rivers originating in the Himalayas in the north. Bhutan is an agrarian society with agriculture contributing to the biggest percentage to the annual GDP. Planned development in Bhutan was initiated in 1961 and since then the focus of the country has been to balance natural resources conservation along with economic development. The policy of the government has been sustainable management of forests and proper land use while supporting agriculture in order to offset the pressure exerted by the increasing population.

The water sector in Bhutan is slowly emerging as an important sector. Previously various institutions were responsible for management and development of different sectors of water resources. The Ministry of Agriculture was responsible for the irrigation sector, the Ministry of Trade and Industry looked after hydropower development and the Ministry of Health was responsible for water supply. The emergence of the Bhutan Water Partnership in August 2001 has been a major development in the water sector. The Partnership is an inter-ministerial body with a mandate to formulate policies and coordinate activities in the water sector. The Water Partnership also promotes integrated water resources management concepts in the country. The Partnership is in the process of developing the Bhutan Water Policy and Act.

Hydropower development in Bhutan has gained considerable ground as a sector capable of contributing to the development of the country by export of power. The Chhukha Hydel Project, constructed in the 80s has been hailed by many as an excellent example of collaboration between two nations for mutual benefit. Many projects are currently being constructed and many more are planned in the hydropower sector. Activities relating to watershed management seem limited with only the Renewable Natural Resources sector under the Ministry of Agriculture that has initiated a few projects. Opportunities lie here for the Himal WANI project to collaborate with the Ministry of Agriculture in order to develop a participatory watershed management project involving local communities and with an entire river basin as a unit. The government has accorded priority to rural water supply and a few projects are underway at the moment. Economic tools and incentives for effective watershed and water resources management are also largely absent. Exploring avenues for a project based on payment for environmental services is another opportunity for the Himal WANI project. Table 1. below provides an overview of the institutional framework of Bhutan in the water sector. Annex 1. provides contact and other information on these institutions.

**Table 1: National Level Overview**

<b>Institution</b>	Ministry of Agriculture	Ministry of Trade and Industry	Ministry of Health	Bhutan Water Partnership	National Environment Commission
<b>Sector</b>	Irrigation and Renewable Natural Resources	Hydropower	Rural Water Supply	Policy formulation and coordination of the entire water sector	Natural resources and the environment
<b>Policy</b>	National Forest Policy; National Irrigation Policy; Biodiversity Action Plan; National Forest Policy	Electricity Act		Bhutan Water Policy; Bhutan Water Act	Environmental Assessment Act; National Environmental Strategy; National Environmental Action Plan; National Environmental Protection Act
<b>Projects</b>	Wang Watershed Management Project; Renewable Natural Resources Project; Lingmutey Chhu Watershed Project	All hydropower projects and transmission grid construction and extension projects	Rural Water Supply and Sanitation Program	Workshops and consultations for the formulation of the Bhutan Water Vision, Policy and Act	Formulating and implementing policies and action plans
<b>Partners/ Donors</b>	BTF, Danida, European Union, Helvetas & SDC, IDRC/IRRI, IFAD, JICA, SDA, UNDP, World Bank, WWF	Government of India	UNICEF, UNDP, SNV, WHO, Danida	GWP, various ministries	The Royal Government of Bhutan, GEF

## 1. Bhutan: An Overview

The Kingdom of Bhutan lies in the eastern Himalayas. It shares its northern border with the Tibet Autonomous Region of China and with the Indian states of Sikkim in the west, West Bengal and Assam in the south and Arunachal Pradesh in the east. Its total area is 47,000 sq. km and is mostly mountainous with some valleys and savanna (CIA, 2004). Bhutan can be classified into three main geographical zones:

- The foothills: 20 km wide in the southern end of the country bordering India and rising to an elevation of 1,500m
- The middle or intermediate range, rising to an altitude of 5,000m
- The high mountain area with altitudes exceeding 7,500m

Population estimates range from as high as 2,185,569 (CIA 2004) to as low as 600,000 (Gyamtsho 1996, Tshering 2000, MoA 2002). Regardless, Bhutan is one of the least densely populated countries of the world. However, its population growth rate is 2.12 percent per annum can be considered quite high. Bhutan's climate is dominated by a southwestern monsoon, which originates from the Bay of Bengal. The monsoons start from June and last until early September with post monsoon showers occurring during October and November (Mool et al., 2001).

Due to the mountainous and steep terrain of the country, most of the rainfall immediately flows as surface runoff despite the significant vegetation cover. The government policy has focused mainly in the sustainable management of forests and proper land use while supporting agriculture in order to offset the pressure exerted by the increasing population of the country (Gyamtsho 1996).

### 1.1 Agriculture

Bhutan is an agrarian society with the agriculture sector contributing the biggest percentage in the annual GDP of the country. Agriculture and livestock are the major sources of livelihoods, constituting 45% of the \$2.7 billion GDP (estimated) of the country (CIA, 2004). However, the country's arable land is only about 7.8 percent of the total area of the country (ICIMOD 1999). The predominant agricultural land uses are the irrigated paddy fields (*chhuzhing*), dryland (*kamzhing*), slash and burn agriculture (*tseri*), and orchard cultivation.

Shifting cultivation is also practiced by the people of Bhutan due to the limitations imposed by the rugged terrain of the country to expanding sedentary agriculture. The acute shortage of irrigation water, lack of opportunities for expanding irrigated area and low soil fertility also contribute to the continued shifting cultivation practices. The government of Bhutan is committed to phasing out this practice without causing adverse effects to the people (Upadhyay 1995). Due to limited availability of agricultural land, there is an increasing intensification of use. Pressure on converting existing forests into agricultural land is also significant. However, the government so far has refrained from such conversion (NEC 1992).

## **Figure 1: Land Use in Bhutan**

Source: Kumar P. Upadhyay, 1995 [http://www.fao.org/DOCREP/006/V8380E/V8380E03.htm#P132\\_21893](http://www.fao.org/DOCREP/006/V8380E/V8380E03.htm#P132_21893)

Livestock rearing also constitutes a major livelihood source for the people of Bhutan. More than 95 percent of households own cattle (ICIMOD 1999). Livestock provide draught power and manure for crop production, which in turn is a source for feed and fallow grazing. Official records estimate that about 10-12 percent of the total land area of the country is under seasonal grazing and grazing land overlaps with forest in all the districts (Upadhyay 1995). The use of forests for grazing is a threat to the forest resources of the country as it prevents regeneration and trampling by cattle on steep slopes causes erosion (NEC 1992). Thus agriculture, livestock and forestry are intricately related in the Bhutanese farming system.

### **1.2 Forest Resources of Bhutan**

The major natural resource of the country is its largely intact forests that cover approximately 72.5 percent of the area (Sharma 1983, ICIMOD 1999 and MoA 2002). The species' composition of the forests can be classified into three broad ecological zones. Forests that occur in the range of 200 to 1,000 m in the southern foothills are known as subtropical. The temperate zone forest lies between the altitudes of 1,000 and 4,000 m. The alpine zone forest occurs at 4,000m and above (ICIMOD 1999). The forests of Bhutan are of national significance since many sectors of the economy such as agriculture, livestock, industry as well as hydropower are intricately associated with the available forest resources. Protection of biodiversity is also dependent on the protection of the forest cover and this in turn can provide the basis for a tourism industry.

Land degradation problems are minimal in Bhutan due to pro-environment policies and programs. Popular participation in policy formulation is encouraged at all levels through local institutions. The rapid population growth rate, increasing livestock population, limited availability of land and fragmentation of landholdings are major threats to the land resources and land management in the country (ICIMOD 1999). Despite the pro-environment policies of the government, a measurable amount of land degradation is now visible. Bhutan's urban growth rate of 6.7 percent has had to be accommodated on forested slopes, scarce agricultural land and wetlands. Erosion is increasingly evident as agriculture and urbanization exhaust flat lands and shift to vulnerable slopes. The impacts of land degradation are mostly felt by rural households whose livelihoods are disrupted by frequent landslides and who face declining crop productivity due to loss of soil fertility (World Bank 2004).

The initial focus of the Department of Forestry on revenue generation from the forest resources has shifted towards sustainable management of the resource, especially after the nationalization of logging operations in 1979 (NEC 2002). About 20 percent of the country's need for timber, products for wood-based industries and fuelwood is currently met through Forest Management Units (FMUs). The government plans to provide all timber and firewood requirements from FMUs while conducting detailed inventories of forest resources for better planning and environmentally friendly harvesting and road construction methods (NEC 2002). Apart from timber, exploiting the high-value, low-volume non-timber forest products are also encouraged.

The Bhutanese government recognizes the roles of forests in soil and watershed conservation and as habitats for flora and fauna as main values of forest resources (Gyamtsho 1996).

In recognition of the significance of the forest cover of Bhutan mitigating the effects of erosion and landslides in this country of steep slopes, the government has decreed through the Forest and Nature Conservation Act, 1995 that 60 percent of the land area will remain permanently under forest cover. Approximately 970,000 ha of the total area of the country's forests have also been declared as protected (Gyamtsho 1996). Nevertheless, pressure on forest resources is mounting with the rapid population growth. Since forests are mainly utilized for fuelwood as a source of energy, the government urgently needs to plan for providing alternative sources of energy to its population.

### **1.3 Freshwater Resources of Bhutan**

The kingdom of Bhutan is dissected by fast, south flowing rivers that run through deep and narrow gorges due to the mountainous terrain of the country.

The four major rivers of Bhutan are the Amochu (Torsa), the Wangchu (Raidak), the Puna Tsang Chu (Sunkosh) and the Dangmechu (Manas) fed by Himalayan glaciers and they all flow into the Brahmaputra in the south (Sharma 1983, Gyamtsho 1996, NEC 1992, Tsering 2000, Mool et al. 2001). Locally water is available in the form of streams, lakes, springs, rivers and ponds. The annual renewable freshwater resource per capita is estimated at 58,930 cubic meters, indicating that the country is not currently under water stress (Gyamtsho 1996, NEC 2002).

The area above an elevation of 4000 masl is covered with snow and ice year round. The glaciers as well as glacial lakes are the sources of headwaters of the rivers of Bhutan (Mool et al. 2001). The southwest monsoons bring much of the rainfall from the Bay of Bengal between June and August. Average annual rainfall ranges from 2,000 to 5,000 mm in the foothills, while the middle mountains receive between 500 to 1,000 mm and precipitation is less than 500 mm in the high mountains (Tshering 2000).

## **Figure 2: Major Rivers of Bhutan**

*Source: Inventory of Glaciers, Glacial Lakes and Glacial Lake Outburst Floods, Mool et al. ICIMOD*

## **Figure 3: Surface Water Withdrawals by Sector, Bhutan, 1987**

*Source: Earthtrends <http://earthtrends.wri.org/text/water-resources/country-profile-22.html>*

Water use in Bhutan in general can be divided into three distinct sources.

- The main rivers of Bhutan provide water for hydropower generation. The main rivers of Bhutan have aesthetic roles and can provide for tourism development. There is an opportunity for developing the main rivers to supply water to urban areas.
- Tributary rivers and streams provide water for irrigation and water supply. Users utilize the nearest source of water for irrigation through gravity.
- Sub-surface sources of water such as springs and aquifers are utilized for domestic water supply and small-scale irrigation.

## **2. KEY WATER RESOURCES ISSUES**

### **2.1 Abundant yet Scarce**

While water resources are seemingly abundant, there have come signs of water scarcity as more people put increasing pressure on the scarce and erratic waters for irrigation and drinking purposes. Bhutan has a colossal freshwater availability however, a significant portion of the agricultural lands depend on the seasonal rainfall. Only about 12.5 percent of arable land is covered by irrigation schemes so far (SaciWaters 2004). For Bhutanese living in the hills, water flowing in the large rivers in deep gorges of the country is mostly out of reach and the lack of flat terrain also limits the utilization of water for irrigation. Forty two percent of the population still does not have access to safe drinking water (Subba 2001). The country does not have an industrial base nor does it have very many urban centers that might utilize this immense water availability (Subba 2001).

The availability of water at the national level gives a false sense of security since the uneven distribution of rainfall in time and space leads to seasonal and local imbalances. Major fluctuation is observed between lean season and monsoon flows in the rivers, which limits the generating capacity of hydropower plants. The pressure on water is mounting due to competing demands from users. While in the past, water was only used for domestic and agricultural purposes, now domestic water demand is increasing due to changing lifestyles caused by socioeconomic development. Water use for agriculture is expected to increase due to its intensification to keep pace with food demand of the growing population and new demands are emerging from other sectors such as hydropower and industries. Urbanization will impact water demand and allocation as well (SaciWaters 2004).

## 2.2 Hydropower Development

Traditionally the use of water was mostly for irrigation and domestic use. In recent years, the fast flowing rivers of the country have attracted attention for developing hydropower. The theoretical potential for hydropower from Bhutan is estimated at 20,000 MW. Although the country has a number of mini and micro hydropower plants, the Chukha project, completed in 1988, is the only major hydroelectricity project producing 336 MW to an existing 10.5 MW of power (NEC 1992).

Hydroelectricity production is considered to be the most obvious and feasible use of the waters of Bhutan in run-of-river type schemes (Subba 2001). Although hydropower is a potential source of income for the country, the fragile geology requires that careful planning be implemented for the selection of sites and development of hydropower. Bhutan may be in a position to provide energy to downstream India. Large dams mean borrowing large sums of money and for a small country this requires careful policy and foresight. Even the Chukha project, hailed as the reason for the improvement of the per capita GDP of the country and built in the relatively short period between 1975 and 1989, had a cost escalation of 300 percent between construction plan and project completion. Despite the success of the Chukha, Bhutan is wary of the economically and politically more powerful neighbor when it comes to negotiations of energy tariff (Subba 2001). Mini and micro hydropower plants is another avenue Bhutan could pursue in order to reach its rural population since the energy from large dams would require a large amount of expense to be available to rural people living in the mountainous terrain. Bhutan has set up 20 mini and micro hydropower plants with a total capacity of 3.4 MW (Subba 2001).

### Figure 4: Existing Hydropower Plants and Transmission Grids of Bhutan

*Source: Inventory of Glaciers, Glacial Lakes and Glacial Lake Outburst Floods, Mool et al. ICIMOD*

## 2.3 Glacial Lakes and GLOFs

Glacial lakes and glacial lake outburst floods (GLOFs) are another aspect of water resources of the country that needs proper management. Apart from landslides and erosion, the mountainous region of Bhutan is also susceptible to disastrous hazards due to GLOFs. Glacial lakes are formed due to glacial retreat as a result of rising temperatures and in Bhutan it has been observed that some of the glaciers are retreating by about 20-30 m in a year (Mool et al. 2001). Recent studies have indicated that of the 2,674 glacial lakes dotting the 677 glaciers in the kingdom, 24 are potentially dangerous (Subba 2001). Bhutan was rudely awakened to the threat of GLOFs in 1994 when the Luggye Tsho Lake burst wreaking havoc in the former capital Punakha (Mool et al. 2001 and Subba 2001).

## 2.4 The Demand for Integrated Water Resources Management

The current water sector issue in Bhutan that is slowly being addressed by the Bhutan Water Partnership, is the need for coordination of the fragmented and sectoral management currently prevalent in the country. In order for effective management of water resources, Bhutan needs to

formulate appropriate legislation. A recent push towards this direction is the formulation of the draft Bhutan Water Policy by the Bhutan Water Partnership. An integrated approach to water resources management can only be possible if there are appropriate laws in place.

Hydropower sector is another major area of demand for water resources development. The Department of Power under the Ministry of Trade and Industry, has initiated the construction of a number of projects with assistance from the Government of India and various projects are currently being planned. Sustainable hydropower development in Bhutan depends on the overall health of the watersheds of the country. Appropriate land management practices in the watersheds will in turn benefit the life of the installed projects. An avenue lies here for exploring the integration of economic tools such as payment for ecosystem services provided by upstream land users. The hydropower sector is a major revenue earner of the economy of Bhutan. A part of the revenue thus generated could be ploughed back to conserving the watersheds and river basins that the projects depend upon.

Water demand for irrigation as well as domestic use is likely to increase in Bhutan due to its rapidly increasing population. Agriculture is the major livelihood option for the people of Bhutan and the government consequently is exploring avenues for agricultural diversification in order to maintain food security and sustain livelihoods in the country. Water plays an important role here and its scarcity will most likely lead to use conflicts. Thus a holistic management of water as a vulnerable resource with the participation of local communities is essential for resolving potential conflicts in Bhutan. Institutional strengthening and coordination is essential for better management of water resources. The Renewable Natural Resources Centers of the Ministry of Agriculture are focal institutions for promoting sustainable natural resources management in the country and have initiated a few watershed management projects.

Bhutan is a country of steep terrain and deep gorges. Climate change issues in Bhutan have gained priority with the acknowledgement of the vulnerability of the country. GLOFs are a major threat to the country along with increased landslides. Bhutan lacks appropriate data and information systems in order to cope with the threats of climate change. A proper framework for early warning systems and relief strategies need to be developed in order to deal with water-induced disasters. Bhutan is currently preparing its National Adaptation Program of Action (NAPA) for climate change issues (Namgyel 2003).

### **3. WATER RESOURCES MANAGEMENT INSTITUTIONS, POLICIES AND LEGISLATION**

Water use in Bhutan in the past was mainly for agriculture. In recent times, sectors like hydropower and water supply have emerged to claim their stake on the water resources of the country. Until recent past, no management institution or legislation existed specifically dealing with water resources of the country. The management of water resources was fragmented with disparate institutions involved in different aspects of water use and allocation. Legal and policy framework dealing with water resources were in the form of clauses in the legal frameworks for land and forest use.

## **3.1 Institutional Framework**

### **3.1.1 Local communities**

In Bhutan, arable land and livestock are privately owned, while forests, water and grazing rights are community-controlled and local institutions regulate the use of these lands and resources. However community involvement in such traditional practices of regulation is eroding due to commercialization of the economy and the changing institutional environment (NEC 2002). The need for a balance between the national objective of conservation of natural resources and at the same time attaining food security and improving livelihoods has been felt in the country (NEC 2002). Focusing on strengthening community management of common resources has shown encouraging signs and this needs to be supported by the government in order to maintain the environment and agricultural productivity.

The government has a predominant role in managing water resources since the state owns all the water resources of the country. Local communities, however, have been using and managing water resources for their livelihoods long before any government intervention and without any government support. Water for domestic use has been organized through individual effort and water for irrigation has been managed by groups that maintain and construct irrigation channels (Tshering 2000).

### **3.1.2 Government Institutions**

#### **a. Ministry of Agriculture and Bhutan Water Partnership**

The Ministry of Agriculture is the main institution responsible for water resources management along with conservation of all other natural resources of the country.

The irrigation sector is looked after by the Department of Agriculture and was responsible for the formulation of the National Irrigation Policy, 1992. The irrigation division is also responsible for engineering irrigation canals and rehabilitation and maintenance of existing canals. Irrigation development is an important strategy for the MoA towards greater self-sufficiency in food grain production. The program aims at providing technical and financial assistance to farmers to construct irrigation channels. Water user's associations are formed for irrigation channels in order to utilize the water effectively (ICIMOD 1999).

In order to promote sustainable development of natural resources the government in its seventh five year plan (1992-1997) introduced a new land based integrated development approach, termed Renewable Natural Resources Development (RNR). The main objective of RNR is to ensure environmental conservation emphasizing the integrated development of crop, livestock and forestry systems within the framework of comprehensive management of watersheds. The RNR is managed under the Ministry of Agriculture. Under the RNR framework, the government envisaged to implement an integrated and holistic Farm Resources Development Program (FRDP) based on areas defined by watersheds. Poor water management was recognized as one of the problems for the agriculture sector and activities under the RNR framework would address this issue (NEC 1992).

Until 2002, water resources management in Bhutan was not recognized as a separate sectoral issue but was treated as a sub-part of watershed, land and forest resources management. Different sectoral ministries had responsibilities for water resources related issues. The Ministry of Trade and Industry was involved in hydropower development and distribution, Ministry of Health for rural water supply, Ministry of Agriculture for irrigation and the Ministry of Communication for urban water supply. The national objective for socioeconomic development through agricultural, hydropower and industrial development has water as the central requirement in recent years in Bhutan

In 2002, the Government appointed the National Environment Commission (NEC) established in 1989, as the agency responsible for regulation and overall coordination of water resources sector.

The need to come up with proper management structures, proper legislation and proper data on water resources was recognized with the launch of the Bhutan Water Partnership in 2001 under the Ministry of Agriculture. The Partnership provides a much-needed multi-stakeholder forum to discuss issues related to water resources. It is an inter-ministerial body with a mandate to prepare policy documents and action plans in the water resources sector. With the launch of the Partnership there is now increasing discussion on using the revenue from hydropower sales for conservation and management of the catchment areas since hydropower production will depend on healthy watersheds (RAOnline 2004). The partnership is in the process of preparing a Bhutan water vision, policy and act.

#### **b. Ministry of Trade and Industry**

The Ministry of Trade and Industry houses the Department of Energy/Power. This department is responsible for planning and developing policies and regulations in the power sector. Power development focuses on hydroelectricity and the department is also responsible for providing adequate, safe and reliable electricity to the people by expanding transmission and distribution networks. Several divisions under the Department of Power are responsible for planning and coordination of the power sector and are also responsible for hydrology, meteorology and flood warning systems.

#### **c. Ministry of Health**

Rural water supply falls under the jurisdiction of the Rural Water Supply and Sanitation Program (RWSS) of the Ministry of Health. Drinking water supply has been accorded the highest priority by the Bhutan Water Policy. Accordingly the RWSS has a mandate to provide safe and affordable drinking water to the rural population of Bhutan. The Public Health Engineering Section (PHES) is responsible for expanding and managing the RWSS. It is responsible for preparing and implementing policies and developing affordable technologies as well as building capacity of local communities so they may take over management and maintenance responsibilities of completed schemes.

#### **d. Other Government Institutions**

The National Environment Commission (NEC) was converted to the National Environment Committee in 1989 under the Planning Commission. During the seventh five-year plan (1992-1997) the Commission's mandate was to coordinate all environmental activities and to monitor the environmental impact of development. The long-term policy objective of the NEC is to raise the material well being of the citizens of Bhutan without impoverishing future generations. The NEC aims to sustain the natural resources of Bhutan by maintaining biological diversity and ecological processes and life support systems. Its immediate policy objectives are to implement a National Environmental Strategy through the National Environmental Action Plan, institutionalize EIA as an integral part of the development process, enhance knowledge and awareness about sustainable development as well as meet national obligations to international conventions such as the CBD and the UNFCCC. The reconstituted Planning Commission of 1999 has the functions of proposing socioeconomic guidelines to the government, issue directives for all development plans of the country, ensure efficient and equitable allocation of scarce resources for the development of the country and monitor and evaluate development programs. The Commission has already formulated the ninth five-year plan of the country (2002-2007) and gives priority to the utilization of water resources under the energy, renewable natural resources and environment sectors in general.

The Department of Planning under the Ministry of Finance is responsible for drafting the country's five-year development plans. The Commission was established in 1971 with broad functions of formulating development strategies, coordinate sectoral activities, policies and programs. The Policy and Planning Divisions (PPDs) of various ministries are directly linked to this Department.

### **3.1.3 Non-Governmental Organizations**

The Bhutan Trust Fund for Environmental Conservation was set up in 1992 as a collaborative venture between the Royal Government, UNDP and WWF. Today it is an independent and autonomous grant making organization with funds from the GEF, WWF and governments of Bhutan, Denmark, Switzerland, Norway, Netherlands and Finland. The Fund grants awards based on the objectives of (i) supporting in-situ and ex-situ conservation initiatives in the entire green sector (ii) strengthening integrated conservation and development planning through applied conservation research and monitoring of biodiversity change and (iii) promoting conservation awareness and education of conservation policies and issues.

Non-governmental organizations such as Helvetas, SNV and WWF also work in Bhutan in collaboration with each other and with the government in various projects and programs. Helvetas works in the renewable natural resources sector promoting sustainable use of natural resources and efficient agricultural production, crop diversification, etc. SNV works under key areas of promoting local governance, building economic opportunities and sustainable management of natural resources. SNV supports the Rural Water Supply and Sanitation Program of the government by providing technical assistance. WWF Bhutan through its forests and freshwater program aims to conserve the biodiversity as well as natural resources of the country.

## **3.2 Policy and Legal Regimes on Water**

### **3.2.1 Land and Irrigation Related Legislations**

Agriculture has always featured as prominent sector for water use in Bhutan. Irrigation remains the prime user of water. The Land Act, 1979 was the single piece of legislation dealing with water use until the Irrigation Act was prepared (Tshering 2000). The Land Act has an entire chapter on irrigation elucidating the rights to and responsibilities for water use and management.

The Land Act grants permission to harvest water for irrigation, provided the person doing so does not cause damage to other's property, house, and plantations. It also empowers the person to maintain an existing channel and its related structures even if these affect somebody who does not benefit from the system. The Act allows water sharing by either mutual understanding or under existing traditional practices. Otherwise, water is to be divided among the landholders according to land holding size and the amount of water available in the system. Likewise, system maintenance responsibility in labor terms is also based on the size of the holding (Tshering 2000). According to the availability of water in the channel, users can stake additional claims and new users can be added. But when water is scarce or when the system has not been upgraded to carry more water, the act strictly bars people from increasing their share of water allocation.

After a number of interactions at the local and national levels in 1992, the government approved the National Irrigation Policy to lay down the procedures for irrigation development. The policy requires the formation of Water User's Associations (WUAs) and encourages farmers to take the leading role in the management of irrigation channels. Assistance to irrigation development calls for a multidisciplinary effort since it is a complex activity involving physical, agricultural and social aspects. Key features of the policy are the emphasis on long-term sustainability and development of institutional capacities (Tshering 2000 and RNR 2004).

### **3.2.2 Electricity Act 2001**

The Electricity Act, 2001 provides the legal basis for the exploitation of the hydropower resources of the country. A Bhutan Electricity Authority is to be established which has the responsibility of setting technical and safety standards for hydropower facilities. The act also lays the framework for the formation of private power companies and their participation in the supply of electricity. The Act recognizes the need to use some of the significant financial resources arising from hydropower export for domestic watershed management (NEC 2002).

### **3.2.3 Other Acts and Policies Regarding Water Use and Management**

The National Forest Policy, 1974 has provisions regarding watershed management. The policy recognizes that deforestation and bare slopes cause loss of the rich topsoil increasing sedimentation in rivers and also causing devastating floods. The Forest Department is mandated to carry out remedial measures to reforest bare slopes, stop further deforestation and implement appropriate agricultural practices, such as land terracing, to protect watersheds and associated water resources. The felling of trees along stream banks in private lands is also prohibited in order to prevent soil erosion and protect sub-surface water sources. Apart from this, the Forest and Nature Conservation Act, 1995 and the Livestock Development Policy and Strategy, 1995 also contain topics related to water. The Forest and Nature Conservation Act, 1995 recognizes

the lack of legal provision for soil and water conservation programs on private lands. It empowers MoA to take up soil and water conservation programs on private land if found necessary to protect these resources (ICIMOD 1999). The Forest Act stipulates that water is the property of the state and individuals and groups must acquire rights by obtaining permits from the Ministry of Agriculture. Pollution control measures are also specified in the act (Tshering 2000).

In the Vision 2020 document, watershed management is described as a key component for placing the country in a sustainable path, particularly to maintain soil fertility, maintain biodiversity as well as help in combating soil erosion and other environmental degradation. Highest Priority is accorded to developing a management plan for the Wang Chu watershed with the aim of developing management plans for other watersheds in the future as well (Planning Commission 1999)

The Ninth Five Year Plan (2002-2007) of Bhutan states that although the country is rich in water resources these are vulnerable to degradation due to soil erosion and unsustainable land use practices of forestry, agriculture, urbanization and other human interventions that cause rapid loss of habitat and genetic diversity. Natural disasters like floods and landslides occur as a consequence of such degradation, which in turn can reduce affected communities to poverty.

Water resources management and utilization of the water resources of the country is not seen as a separate sector in the ninth plan. The ninth plan emphasizes the formulation of various plans for effective water resources management including the Energy Master Plan and the Water Resources Management Master Plan. Apart from such plans monitoring and survey of the water resources of the country is rendered essential as well to ensure the maintenance of quality, species diversity as well as hazard mitigation. Under the ninth plan, the government is aiming for 100 percent piped potable water supply by the end of the plan period. The average annual growth rate of the power sector is projected at 12.2 percent according to the ninth plan. Accordingly the use of water for hydropower development is prioritized under the energy sector in the ninth plan. The objectives for hydropower development are (i) to realize the economic self reliance of the country through electricity generation capacity, (ii) to provide adequate, safe and reliable electricity through sustainable and environmentally friendly development of hydroelectric potential and (iii) to achieve 100 percent rural electrification by 2020. Rural electrification is accorded priority over other development in the power sector.

Bhutan has recognized that the benefits of economic development can only be fully realized once environmental effects are taken into consideration at the initial project-planning phase. The need for EIA was stressed in the conclusion of the Paro Workshop, 1990. The National Environmental Committee gave the Secretariat a mandate for the institutionalization of EIAs. The aims of the National EIA guidelines are to (i) optimize the benefits of development without degrading environmental quality and the natural resource base and (ii) integrate environmental considerations within the project planning cycle (NES 1992).

The National Environmental Strategy, 1997 was formulated by the National Environmental Secretariat (NES) and coordinates its implementation. All agencies, government or private or otherwise, follow the strategy while implementing environmental programs. The Strategy

formulation was triggered due to international events such as the Brundtland Report and the Rio Declaration. However, its contents reflect the Bhutanese philosophy of spiritual and material development while respecting the need for conservation. The ultimate aim of the Strategy is to provide improved living conditions for rural communities using sustainable resources. The Strategy defines and outlines hydropower development, self-sufficiency in food production and industrial development as the three avenues of sustainable development (ICIMOD 1999).

### **3.2.4 Draft Water Policy**

The draft Bhutan Water Policy has incorporated IWRM as a guiding principle for water resources management in the country. The draft policy stresses that management of water resources will be at the river basin level in recognition of the impact of land use on water resources and upstream downstream linkages. Water resources management in Bhutan is intended to be carried out in an integrated manner with the participation of all stakeholders since improper management stem from a lack of integration, top-down management and disregard for upstream-downstream linkages. The draft Policy is the first ever attempt at formulating a comprehensive legislation in the water sector in Bhutan. The need for such umbrella legislation was clearly felt with the increasing demands on water placed by the various sectors and the existing fragmented management structure for water resources.

The NEC produced the draft Bhutan Water Policy in March 2002 and currently awaits government approval. The policy stresses that sustainable water resources management can only be achieved through the integration of conservation, development and scientific management of water resources. It stresses the need for watershed conservation to reduce floods and landslides and to decrease sediment load of rivers.

The policy advocates the management of water resources at river basin levels and with active stakeholder participation. Drinking water and sanitation have been given the highest priority for water use.

Current water management institutions work independent of each other and this has resulted in fragmented data, duplication of efforts and poor resource management systems. There is no institutional linkages and coordinated planning of the entire water sector (SaciWaters 2004).

The draft policy covers all forms of water including rivers, streams, lakes, snow, glaciers, springs, rainwater, soil moisture and ground water. Highest priority is accorded to the allocation of water for drinking and sanitation purposes. Irrigation, hydropower development, industrial use and recreation will be given priority according to local needs. In general, priority for water use has been ranked as follows in order of decreasing importance:

- Drinking water and sanitation
- Irrigation
- Hydropower
  - Industries
  - Other uses

The policy clarifies that the state has the mandate to regulate the use of water resources and resolve conflicts.

Once the policy is approved by the government, comprehensive water legislation will be developed in order to regulate water abstraction for commercial purposes and the quality and quantity of effluents that may be discharged into water bodies. Management will also take a participatory approach including all stakeholders and with gender balance in decision-making processes. Water resources will also be protected from pollution in order to ensure the quality of the resource. Water management for flood control will also be carried out in an integrated manner with special focus on glacial lakes and GLOFs. The policy also has provisions for the development of transboundary water resources following international laws and conventions and with the consent of neighboring countries.

#### **4. WATER RESOURCES DEVELOPMENT AND MANAGEMENT PRACTICES IN BHUTAN**

There is very little information available on the current water resources related projects in Bhutan. A number of hydroelectricity projects are either being constructed at present or are planned to be constructed in the near future. These projects are mainly funded by the government of India and power developed is exported to the huge neighbor or used to meet domestic demand. The hydroelectricity projects are planned and executed by the Department of Power of the Ministry of Trade and Industry. Water supply projects are also being implemented in the rural areas of the country in order to meet the priority of the government to provide safe drinking water to much of its population. Water supply schemes were previously administered focusing mainly on the technical aspects. However, increasingly, it has been recognized that community participation is essential in order to make these systems more effective and give the community a sense of ownership. Watershed management projects are implemented by the Ministry of Agriculture and try to integrate aspects of land use and forest use in conjunction with the use and allocation of water resources in order to promote sustainable management of the watershed and enhance sustainable livelihoods. A few of the projects have been described below.

##### **4.1 Watershed Management Projects**

###### **4.1.1 The Wang Watershed Management Project (WWMP)**

This joint project of the Royal Government in collaboration and the European Commission aims to strengthen the capacities of sustainable management of the Wang Watershed. The Ministry of Agriculture is the main project-executing agency. A project management unit is operates from Paro.

The overall objective of the projects is “to enhance sustainable incomes and improve the general standard of living of the rural communities in Haa, Chhukha, Thimpu and Paro Dzongkhags (districts)”.

The project area lies in the western part of the country including the districts of Haa, Paro, Thimpu and Chhukha. The Wang River has been exploited for hydroelectricity in Bhutan. The watershed is threatened by extensive human exploitation of natural resources. Problems of land degradation, deforestation and pollution of water sources are the main challenges to its sustainable management. The WWMP applies a dual strategy of improved management of renewable natural resources in the watershed and developing more productive and environmentally friendly techniques for watershed, land and farm management.

#### **4.1.2 The Lingmutey Chhu Watershed Project**

The Lingmutey Chhu Watershed has a catchment area of 34 sq. km and drains into the Lingmutey Chhu. Farmers in the area use water primarily for growing paddy and for pre-sowing flooding for winter crops. The goal of this project is to conduct research on key natural resource management issues to help improve the livelihood of the local people and to maintain the integrity of the resource base. The focus is on community based natural resource management with full participation of farmers. Major issues associated with the watershed area are drinking and irrigation water shortages, declining forest resources, low crop yield and soil fertility concerns. The watershed serves as a training ground for integrated resource management with full community participation. Among other things, the project aims to:

- Evaluate the water resources and their use in a way that all residents have equitable access and shortages as well as pollution are minimized. This includes determining a water balance as well as evaluating irrigation efficiency and water distribution systems.

The project is sponsored by the International Development Research Center (IDRC) and the Swiss Agency for Development and Cooperation (SDC). The implementing agency is the Renewable Natural Resources Research Center of the Ministry of Agriculture, Bajo, Wangdue.

### **4.2 Water Supply and Sanitation Projects**

#### **4.2.1 Water Supply and Sanitation Program of UNICEF**

UNICEF has been providing assistance to Bhutan to establish rural water supply since 1974. In the past two decades it has helped build and develop more than 1,760 rural water supply schemes reaching more than 200,000 people. UNICEF also helps in capacities building of local people to improve maintenance of water and sanitation facilities in rural areas. Village maintenance committees and water caretakers are being trained to sustain their own services and facilities. Training programs help strengthen capacity of the communities to drive their own development and uphold the tradition of active participation at the community level.

UNICEF has contributed US \$ 5 million to the water and sanitation program in the last five years. In the villages, water supply and environmental sanitation are integrated in an approach called the “model village”, which promotes health and hygiene in a holistic manner. Such model villages are being encouraged in all the districts to serve as examples of healthy living environments. UNICEF supports the training of health workers and community leaders to promote sanitation and hygiene practice.

UNICEF also focuses on the water supply to, and sanitation of, schools and monasteries. The water and sanitation program tries to integrate the provision of hardware with education and hygiene promotion activities so that people really benefit from the facilities. Priority of the project is to reach the more remote schools with facilities so that they become a more conducive place for learning.

#### **4.2.2 Rural Water Supply and Sanitation Program of SNV**

SNV has been supporting the Rural Water Supply and Sanitation (RWSS) program since 1988 through technical assistance. Previously, emphasis was placed on the technical design and construction aspects of RWSS. Less attention was paid on how community management of the constructed systems could be strengthened and supported. Lack of community management of the systems emerged as a real threat to the program in the 1990s. Despite the formation of Village Management Committees (VMCs) and Caretakers, the sustainability of RWSS systems could not be secured. The latest phase of SNV support to the Public Health Engineering (PHE) Division has addressed how community management of rural water supply and sanitation schemes can be made more sustainable.

An SNV supported Community Development Advisor placed within the PHE Division provides advisory support on how the participatory development of RWSS and other community health systems contributes to their sustainability and effective use. The advisor also provides support on government decentralization efforts, participatory approaches and educational curricula.

### **4.3 Hydroelectric Projects**

#### **4.3.1 Tala Hydroelectric Project**

The Department of Power under the Ministry of Trade and Information is in the process of constructing the Tala Hydroelectric Project in collaboration with the government of India. This is a project immediately downstream of the Chukha Project in the Wangchhu River. This 1,020 MW project is estimated to generate 4,865 million units of power and is scheduled to be completed in 2005/2006. With a project budget of US \$750 million, this is the biggest run-of-river project currently under construction in the country. The project is entirely funded by the Government of India's grants and loans. The project will mainly benefit the eastern regions of India and is expected to generate revenue of 40 million Nu/IRS per day.

#### **4.3.2 Kurichu Hydroelectric Project**

This 60 MW run-of-river project is located in the Kurichhu River in the Mongar district of eastern Bhutan. The total project cost is US \$119 million and is entirely funded by the Government of India grants and loans. Generation from three of the four units of the project commenced in 2001 supplying the six districts in eastern Bhutan and two in south-central Bhutan. Surplus power is exported to India through the 132 kV Gelephu-Salakati line.

### **4.3.3 Basochu Hydropower Project**

The Basochu Upper Stage Hydropower Project with an installed capacity of 22.2 MW was commissioned in 2002. The project is financed by the Austrian government under a bilateral assistance and loan. This project has helped augment electricity supply in western Bhutan as well as to improve the reliability of power supply in the region. The Basochu Lower Stage Project has an installed capacity of 40 MW and is scheduled to be completed in 2005. The project is financed under the Official Austrian Export Promotion Scheme Loan. Power generated from this lower project will also be transmitted to the five western districts of Bhutan.

### **4.3.4 Punatsangchu Hydroelectric Project**

This is a pipeline 870 MW project planned to be developed through the assistance of the government of India. The estimated cost of the project is around US\$ 813 million. The two governments have signed a memorandum of understanding for the development of a detailed project report of Punatsangchu. This is a run-of-the-river project along the Punatsangchu River with a 141 m high diversion dam. Feasibility investigation of the project was undertaken between 1998 and 2001 with the assistance of JICA and NORCONSULT-AS assisted in site identification in 1990-1992.

### **4.3.5 Mangdechu Hydroelectric Project**

In 1997, Norway assisted Bhutan in the technical, environmental and economic feasibility studies of the 360 MW Mangdechu project. This project located in the Trongsa district of central Bhutan is considered feasible by the studies conducted. The project construction investment is planned in the Ninth Five Year Plan and is expected to be completed in the Tenth Five Year Plan. The project requires an investment of US\$ 349 million and the Government of India has been requested to take up the project.

### **4.3.6 The Sankosh Multipurpose Project (SMP)**

The SMP is the biggest identified project in Bhutan with an installed capacity of 4,060 MW. The Central Water Commission (CWC) of India prepared a detailed project report in 1997 and estimated the cost at US\$ 1.60 billion. The SMP will be located in Karbari village of Sarbhang district in southern Bhutan. The project would comprise two dams, the main one for power generation and the second to feed a 141 km irrigation canal. Only 13 km of this canal will be in Bhutan and the rest will be in India. The power generated will be supplied to the entire northeast of India reaching up to Merrut in Uttar Pradesh. It would irrigate and supply drinking water to the Indian states of West Bengal and Bihar. The project is expected to take about 10 years to complete.

## **4.4 Donor Priorities in Water Resources Management**

The Government of India (GOI) is the single major donor of Bhutan. The priority of the GOI in Bhutan is the development of hydropower projects for power export to its territories. Among the ongoing projects, Tala Hydroelectric Project and Kurichu Hydroelectric Projects are entirely

funded by India. The Austrian Government is involved in the Basochu Hydropower Project. The Punatsangchu and Mangdue Chu Hydropower Projects and the Sankosh Multipurpose Project are planned to be funded by the GOI. Apart from the GOI, Bhutan has other bilateral and multilateral donor relations with the United Nations, ADB, The World Bank, Australia, Austria, Finland, Denmark, Japan, Norway, the United States, etc (Bhutan News Online 2004). ADB's priority in Bhutan is the reduction of poverty through rural electrification, road network expansion and basic skills development for integrated rural development. ADB assistance to the power sector includes institutional and capacity development and establishment of a policy and legal framework to restructure the power sector (ADB 2004). The World Bank has a small portfolio in Bhutan and the International Development Association's assistance to Bhutan so far has led to the formulation of the Power Development Master Plan (The World Bank 2000).

The European Commission (EC) works in Bhutan for the main objective of reduction of poverty. The Renewable Natural Resources sector is assisted by the EC in order to improve living standards and environmental sustainability through better resource management among other things (EC 2003). The EC assists the Wang Watershed Management Project in collaboration with the Ministry of Agriculture of the Royal Government of Bhutan. The main objective of Danida in Bhutan is reduction of poverty through promotion of sustainable economic development. Danida promotes sustainable and efficient management of natural resources as well as pollution abatement and mitigation. The Environment and Urban Development program aims to enforce environmental laws and regulations, field test and document sustainable land and water management, and build capacity at all levels of government (Danida 2004). The UNDP supports Bhutan in the key area of Energy and Environment by supporting local initiatives, development of national conservation strategies and enhancing Bhutan's ability to address international environmental concerns such as climate change (UNDP 2004). UNICEF and SNV are supporting Bhutan in its rural water supply and sanitation program in collaboration with the Ministry of Health. Helvetas supports the various RNR centers in the country. Annex 2. provides an overview of donor assistance to Bhutan.

It appears that the donor community in Bhutan is mostly concerned with the reduction of poverty through sustainable natural resources management. In the water sector, the focus is on developing the hydropower potential of the country and increasing access of the rural population to water supply.

## **5. CLIMATE CHANGE IMPACTS AND ADAPTATION IN BHUTAN**

Bhutan has a fragile mountainous ecosystem and climate change poses serious threats in this scenario. Threats include increased landslides, glacial lake outburst floods, and adverse impacts on agriculture, biodiversity and water resources. Bhutan however, does not contribute to climate change with a net negative emission of greenhouse gases due to natural cleansing by the 72% forest cover of the country (UNDP 2004). Bhutan ratified the UNFCCC in 1995 (NEC 2000). Like other developing countries Bhutan lacks the necessary data and information as well as technical knowhow in order to develop strategies to effectively cope with the changing climate.

## **5.1 The Initial National Communication**

The National Climate Change Committee of Bhutan is hosted by the National Environmental Commission (NEC) of the country. This committee prepared the initial national communication in order to outline the status of greenhouse gas (GHG) emissions by sources and sequestrations by sinks and to outline national priorities for vulnerability assessments and adaptation options. It shows that Bhutan is in a unique position as one of the very few countries with the ability to sequester GHG emissions. In 1994 GHG emissions were estimated at (-) 5.89 tons of carbon dioxide equivalent per capita (NEC 2000). This negative figure has been attributed to the country's clean development policies. However, six areas have been identified where the country is assumed to be most vulnerable to climate change. These are (i) forests and biodiversity, (ii) agriculture, (iii) water resources, (iv) glacial lake outbursts, (v) health and (vi) landslides (NEC 2000).

## **5.2 Climate Change Impacts on Water Resources**

Climate change may render the country highly vulnerable to scarcity of water. An increase in rainfall may increase runoff, soil erosion and accelerate sedimentation in existing water reservoirs. A reduction in the average flow of snow-fed rivers, combined with an increase in peak flows and sediment yield, would have major impacts on hydropower generation, urban water supply and agriculture (Bhutan 2004). Increases in temperature caused by global warming will result in the retreat of glaciers, increasing the volume of glacial lakes and ultimately provoking glacial lake outburst floods (GLOFs) with potential catastrophes. Possible significant impacts of glacial lake outbursts in the context of Bhutan include perturbation in the quantity of river water used for hydropower generation, destruction of settlements, infrastructure, and agricultural lands and loss of biodiversity, and even human lives downstream (NEC 2000).

During the last few decades there has been a rapid retreat of glaciers creating many dangerous moraine-dammed lakes. It has been observed that some of the glaciers in Bhutan are retreating by about 20-30cm in a year (Mool et al. 2001). The most recent GLOF in Bhutan occurred on 7 October 1994 in the Punakha-Wangdue valley. Partial burst of the Lugge Tsho glacial lake located in eastern Luana, which devastated the downstream valley. A total of 91 households were affected due to this event. Watermills were washed away, dry land was damaged and there was major damage to pasture land affecting the people in the region. A total of 965 acres of pastureland was washed away or covered by sand and silt affecting the yak populations in the area, which is the livelihood of the people. Food grain losses totaled about 6 tons and livestock were carried away by the flood (Mool et al. 2001).

## **5.3 Activities for Climate Change Impact Mitigation**

In 1996 and 1999, a flood mitigation project of the Raphstreng Tsho glacial lake was carried out. The first phase of the project was funded by the Government of India and the Water and Power Consultancy Services (India) Ltd (WAPACOS). Excavation work was carried out in 1996 in order to lower the Raphstreng Tsho Lake by 0.95m. In subsequent years the level was further

lowered by 4m. In 1999 under Austro Bhutanese cooperation, the Raphstreng Tsho Outburst Flood Mitigation Project was started. The main aim of the project was to assess the geo-risks of the Raphstreng/Thorthormi Tsho area. An integrated, multi-disciplinary approach was adopted using remote sensing, geological, hydro-geological, and geophysical methods. The findings from these investigations were that the outburst from the Raphstreng Tsho Lake is low, but the risk of an outburst from the Thorthormi Glacial Lake in the future is high and it could occur in 15-20 years considering the present trend of climate change (Mool et al. 2001).

UNDP and GEF are supporting the Royal Government to strengthen its capacity to address the challenges posed by climate change in a project called Learning to Adapt to Climate Change in the Kingdom of Bhutan under their Energy and Environment Program. The Green House Gas (GHG) project was begun in 1996 and a follow up project is now in the pipeline called the Program of Action for the Adaptation to Climate Change (NAPA). The GHG project supports the government's efforts to identify the sources of GHGs and to identify priority areas in order to mitigate the negative impacts of climate change. The NAPA project will help the government formulate specific plans and strategies in order to enable Bhutan to adapt to climate change (UNDP 2004).

## **6. OPPORTUNITIES TO PROMOTE IWRM IN BHUTAN**

Integrated water resources management is a fairly new concept in the context of Bhutan. The Bhutan Water Partnership was launched in August 2001 and is the sole organization responsible for the water sector. The Partnership has a mandate to formulate policies and coordinate activities in the water sector and promotes IWRM. With the launch of the Partnership, Bhutan has recognized the need for better management of its water resources and this is reflected in the efforts at formulating the new Bhutan Water Policy and Act. Previously, management of the different sectors of water was handled by various ministries with very little coordination. The Ministry of Trade and Industry was responsible for the development of hydroelectricity, the Ministry of Agriculture was responsible for irrigation and the Ministry of Health responsible for water supply. While these sectors still remain with the respective ministries, the Bhutan Water Partnership is making efforts at better linkages between the various institutions.

The local people of Bhutan have been managing their water resources since centuries. Local people built their own irrigation canals in order to irrigate their fields and communities managed their own drinking water schemes. Communities have been managing their water sources along with forests and farm management. With the advent of planned development back in the 1970s, government intervention increased in these areas as well as in realizing the benefits of the hydropower potential of the country. During its development history, Bhutan has realized the importance of involving communities in the development process and gives high priority to participatory development approaches. Bhutan's forest and land policies have been addressing water resources issues in their respective sectors and it seems with the new Bhutan Water Policy and Act, these issues can be integrated into a single legislation dealing with water resources. The Royal Government of Bhutan is committed to conserving its natural resources and would be conducive to promoting integrated water resources management in the country.

Bhutan's recent recognition of water resources as a key development sector, but one that requires an integrated approach as shown by its creation of the Bhutan Water Partnership and the draft water policy provides a clear opportunity for IUCN to support IWRM in the country. However, most of the current investment in water resources sector appears to be in hydroelectricity development under support from the Indian government. It may be interesting to work on the issues of payment for environmental services to watershed services for the hydroelectricity production as one option.

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## Annex 1. Institutional Information

### 1. Ministry of Agriculture

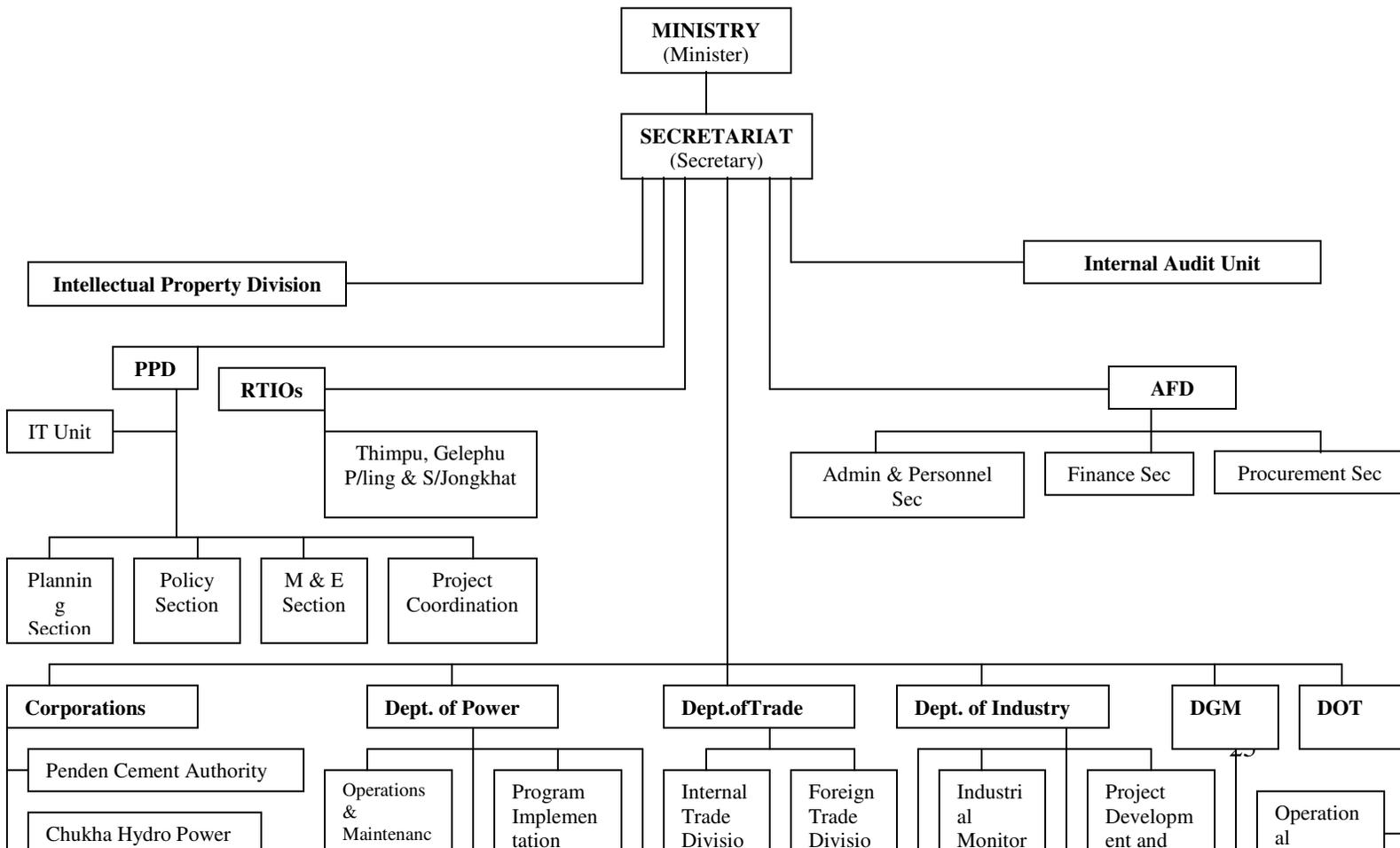
Minister: Lyonpo Sangay Ngedup  
 Address: Ministry of Agriculture  
 The Royal Government of Bhutan  
 P. O. Box 252  
 Thimpu, Bhutan  
 Tel: 00 975 2 323765  
 Fax: 00 975 2 323153  
 Url: <http://www.moa.gov.bt>

Organogram:

### 2. Ministry of Trade and Industry

Minister: Lyonpo Yeshey Zimba  
 Address: Ministry of Trade and Industry  
 P. O. Box 141  
 Thimpu, Bhutan  
 Tel: 00 975 2 322665  
 Fax: 00 975 2 323507  
 Email: [mti@druknet.bt](mailto:mti@druknet.bt)  
 Url: <http://www.mti.gov.bt>

Organogram:



### 3. Ministry of Health

Minister: Lyonpo Sangay Ngedup

Address: Ministry of Health and Education

Thimpu, Bhutan

Tel: 00 975 2 25146

Fax: 00 975 2 25183

Url: <http://www.health.gov.bt/index1.htm>

Organogram:

**4. Bhutan Water Partnership**

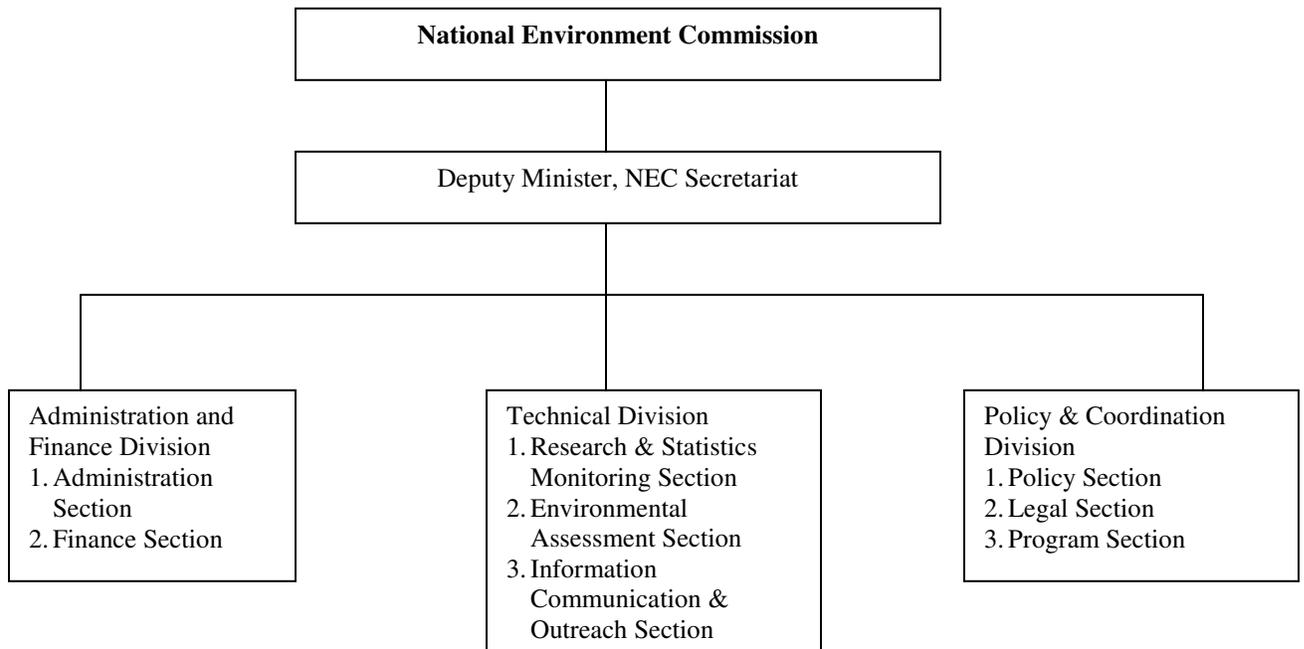
Mr. Sonam Tshering  
C/o Bhutan Power Corporation  
P. O. Box 580  
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Tel: 00 975 2 325095  
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Mr. Kezang Jamtsho  
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**5. National Environment Commission**

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## Annex 2. Donor Assistance in Bhutan

Table 2: Bhutan's Comprehensive Framework of Ongoing Development Assistance

Dev. Partner	Governance	Education	Health	Forestry	Environment	Rural Dev.	Roads	Urban Dev.	Power	Telecom
Austria					Bhutan Trust Fund				Basochhu	
Denmark	Decentralization, Strengthen Royal Audit Authority, Tax Admin Assistance		Integrated primary health care, Essential drugs and safe water		Land use and env planning, Bhutan Trust Fund	Agro-industries		Thimpu and Phuntsoling		
Germany		Tech. & vocational education	Upgrading health posts	Conservation and sustainable mgmt		Promotion of cash crops				
India		Teacher salaries, school const.	Malaria eradication				Const. & maintenance		Tala, Kurichu, Bunakha	Radio transmission
Japan						Paro rural dev.	Paro roads & bridges		Micro-hydels	Microwave Tel. Network
Netherlands	Decentralization				Biodiversity, Bhutan Trust Fund	Cash crops, horticulture dev., Zhemghang rural dev.	Rural roads mgmt		Solar power	
Norway					Bhutan Trust Fund					
Switzerland	Strengthen Royal Audit Authority	Primary/secondary teacher training (with IDA)		Sustainable use, protection & mgmt of forests		Promotion of cash crops, livestock dev., natural resource training center	Bridges and trails			
ADB	Strengthen Min. of Finance	Tech. & vocational education		Forest development		Irrigation support	Highway maintenance planning	Town dev.	Rural electrification	
EU						Livestock/ag. ext. service				
GEF					Bhutan Trust Fund					
IDA	Round table, econ & budget advice	Prim. & lower sec. teacher training	Consultations on long term health finance and infectious disease	Sustainable use, mgmt & protection of forests	GEF supervision of Bhutan Trust Fund		Support RGoB program of improving rural access	Secondary towns		Telecom corporitization
UNDP	Round table,				National parks	Promotion of				

	planning & budgeting, aid coord., priv. sec. dev., modernization of legal system				and biodiversity	cash crops				
<b>UNICEF</b>		Prim. & lower sec. teacher trng., prim educ, adult literacy	Immunization, MCH, family planning							
<b>WFP</b>		School meals					Food for work			
<b>WHO</b>			Disease prevention, human res. dev.							
<b>WWF</b>					Bhutan Trust Fund					

Source: The World Bank Country Strategy. [http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2000/04/05/000094946\\_00032105550823/Rendered/PDF/multi\\_page.pdf](http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2000/04/05/000094946_00032105550823/Rendered/PDF/multi_page.pdf)