COUNTRY LEVEL ASSESSMENT
OF
WATER SUPPLY AND SANITATION
IN
BHUTAN

unicef

Public Health Engineering Section
Department of Health Services
Ministry of Health and Education
Royal Government of Bhutan
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TABLE OF CONTENT

MAPS

LIST OF TABLES, FIGURES, BOXES AND MAPS

TABLES

FIGURES

BOXES

ACRONYMS

ADB	Asian Development Bank
ARI	Acute Respiration Infection
BHU	Basic Health Unit
CSO	Central Statistical Organization
DANIDA	Danish International Development Assistance
DHSO	District Health Superintending Officer
GNM	General Nurse and Midwife
DUDH	Department of Urban Development and Housing
FYP	Five-Year Plan
GDP	Gross Domestic Product
HRD	Human Resources Development
IMR	Infant Mortality Rate
MoA	Ministry of Agriculture
MoC	Ministry of Communication
MoF	Ministry of Finance
MoHE	Ministry of Health & Education
NGO	Non-Governmental Organization
NEC	National Environment Commission
O&M	Operation and Maintenance
PCC	Phuntsholing City Corporation
PHES	Public Health Engineering Section of the Department of Health
PHE	Erstwhile Public Health Engineering Unit under Public Works Department
PWD	Public Work Division
RCSC	Royal Civil Service Commission
RIHS	Royal Institute of Health Services
RTM	Round Table Meeting
RSPN	Royal Society for Protection of Nature
RGoB	Royal Government of Bhutan
RWSS	Rural Water Supply and Sanitation
$	US Dollar
TCC	Thimphu City Corporation
UNDP	United Nations Development Programme
UNICEF	United Nation Children Fund
VHW	Village Health Worker
VWC	Village Water Committee
VWCs	Village Water Caretaker
WHO	World Health Organization
WSS	Water Supply and Sanitation

GLOSSARY OF BHUTANESE TERMS

Dzongkhag	District Administration
Dzongda	District Administrator
Geog	Block
Gup	Block Headman
DYT	Dzongkhag Yargye Tshogchung (District Development Committee)
GYT	Geog Yargye Tshogchung (Block Development Committee)
Nu	Ngultrum, Bhutanese currency (1 Indian Rupee= 1Nu)
Ch	Chetrum, 100 Ch = 1Nu.

EXECUTIVE SUMMARY

This assessment is a critical review of the diverse issues of water and sanitation in Bhutan ranging from resources, policies and strategies, investments, institutions, and related issues at the national level. The Kingdom of Bhutan lies in the eastern Himalayas, where the predominant employment and income generation for the majority of the population is through agriculture. Bhutan has experienced gradual economic stability and growth and during the period 1990 to 2000, the GDP growth has been maintained at an annual average of 6%. The per capita GDP for 2000 has been estimated at US$ 1,412.00

The estimated population of Bhutan in 2001 was 698,950, with a male:female ratio of 1:0.98. The distribution of urban and rural population is estimated at 21% and 79% respectively. Bhutan is classified as one among countries with low human development with an HDI index of 0.494. Bringing health care to closer to the people is an enormously hard task owing to the sparse population spread randomly across the country's mountainous terrain. Malnutrition, diarrhoea and dysentery, respiratory tract infection, parasitic infections and skin and eye infections related to personal hygiene affect the general health of the people. Many of the diseases are linked to problems of water supply and sanitation.

Formal planning in Bhutan began with the first five-year plan (1962 -1967) when the country just opened up to the outside world. The water supply sector began to emerge in 1974 with the start of assistance by UNICEF to Bhutan. With assistance from WHO/SEARO, a national master plan for the water and sanitation sector was developed and formally adopted in the country's fifth five-year plan (1982-1987).

Presently at the national level, the Public Health Engineering Section (PHES) under the Department of Health is responsible to coordination and management of rural water supply and sanitation (RWSS) activities. The Department of Urban Development and Housing (DUDH) have the responsibility of urban development including planning and implementation of urban water supply and sanitation. At the implementation levels, all consumptive water-dealing institutions work closely with the district administrations (*Dzongkhag*).

Realizing water to be a key element in the socio-economic development process of the country, the third five-year plan (1972-77) saw the gradual emergence of responsible water and sanitation sectors receiving advisory, financial and technological assistance from a number of external agencies. The rural water supply and sanitation (RWSS) programme began in 1974 with UNICEF cooperation that included technical support, financial assistance, non-local supplies and equipment. The overall achievement of the water and sanitation sectors as of 2000 is largely accredited to the coordinated efforts of the UNICEF and its bilateral partners and the commitment placed by the Royal Government in reaching these basic human needs to the grass-root levels.

Within a decade, the national average rural water supply coverage had expanded from 30% in 1990 to 78% in 2000 in terms of numbers of households. The year 2000 coverage represents a total of 2,359 water supply schemes, 987 spring protections and 664 rehabilitated schemes in total serving an estimated rural population of 415,000. Variations exist in the coverage of rural water supply among the country's 20 districts ranging from a low of 65% to as high as 98% for the year 2000. The low coverage of rural water supply (<75% coverage) is evident in some of the populous districts and also in some lesser districts that are characterized by remote and highly dispersed populations. The districts with high water supply coverage (>85% coverage) are characteristic of low population densities and further have had the advantage of having more clustered villages in relation to other districts. In the same decade, the national average urban

water supply coverage had expanded from 62% in 1990 to 81% in 2000 in terms of urban population.

The identification and prioritization of development needs of the people are functions carried out at the block (*geog*) level but reviewed and further prioritized at the district (*Dzongkhag*) level. Field surveys and preliminary data collection for rural drinking water schemes are done at the district level by the district engineering staff but the designs and cost estimates are prepared and finalized by the Public Health Engineering Section (PHES) at the central level. PHES does the procurement of non-locally-available materials that are then transported to concerned districts. The communities contribute labor and local materials in the implementation of the water supply schemes. The commitment of the beneficiary communities to the upkeep of the system is engaged by the formation of village water maintenance committees and by appointments of village water care-takers. The urban water supply and sanitation activities implemented by the Department of Urban Development and Housing (DUDH) also follow the same procedure as in the case of rural water schemes with the difference that their works are usually tendered out. The town municipalities under the district administrations are then responsible to the operation and maintenance of their water supply systems.

Rural household sanitation coverage in terms of latrines constructed has accelerated during the last decade, mainly as a result of the royal decree in 1992 that mandated very household to maintain a latrine. Rural sanitation coverage expanded from 50% in 1990 to 87% in 2000, whilst in the urban settings, the sanitation coverage has fallen from 80% in 1990 to 77% in 2000. The drop in urban sanitation coverage is mainly due to growth of urbanization affected by rural to urban migration.

The rural water supply sector put emphasized on accelerating increased number of schemes until the end of seventh five-year plan (7FYP, 1992-1997) and gauged their achievement through the coverage. This however led to neglect of construction quality of the schemes as well as the quality of the water supplied by the scheme. This may have contributed in lowering the expected lifespan of the schemes from 20 years design life to an average of about 12 years in reality as indicated by the survey of 664 rehabilitated schemes. The question of sustainability arises as is recognized that rural communities and communities in the newly emerged satellite towns lack the skills and proper know-how of project implementation and are unlikely to know the range of operation and maintenance technologies and their associated costs. Standards of workmanship are low and long-term sustainability is hampered because essential materials for the projects come from different sources, making standardization impossible.

The urban water supply sector laments the existing inadequate regulatory framework as the main constraint to sustainable urban development. The local revenues in most towns are inadequate to operate and maintain infrastructure & services and to finance developmental activities. Poor locations of many towns in terms of availability of good and adequate sources of water have put pressure to the sector in providing efficient and cost effective services. Bhutan is still dependent on external aid for almost all of its development projects. This is a vital factor for making all plans and programmes successful as without a confirmed financing source, no programme however efficiently planned can be realized.

While infant mortality and maternal mortality rates have declined substantially during the decade, they are still considered high. Among the leading causes of mortality under 5 years, the most notable is respiratory infection, followed by diarrhoea and dysentery, skin and eye infections, parasitic infections and others. These diseases are related to unhygienic conditions particularly in the rural areas and the role of safe drinking water supply and sanitation programmes have a direct link to the improvement in these areas of concern. The decreasing trends in reported cases of

hygiene related morbidity is the result of expanding rural water supply programmes and the promotion of sanitation through the UNICEF initiatives in environmental hygiene. During the last decade, diarrhoea and dysentery, helminthic infestations and skin infections have decreased in significant proportion showing a positive impact on the general well-being of Bhutan's population.

Some of the important plans and national strategies in the development of the drinking water sectors include expansion of institutional framework and implementation strategy, devolvement to facilitate decentralized planning and implementation, support private sector participation, and strengthen HRD and training activities. The development of infrastructure and capacity building remains a high priority for the government in its endeavour to improve quality of services in order to improve the quality of life of the Bhutanese people. The current programmes under PHES and DUDH continue to receive the much-needed impetus from external funding besides the Royal Government's limited planned outlays.

The "Water, Sanitation and Hygiene Promotion Project" supported by UNICEF supports both PHES and the Department of Education. The project is actively involved in implementing a variety of activities in the encouragement of children to become agents of change to reach rural communities. Besides supporting institutional and capacity building activities at the national, district and local levels, this project includes direct support to rural schools, monastic institutions and the basic health units. With the objective to reach full coverage, the rural water supply programmes receive the active support of DANIDA with commitments to fund construction of 494 new rural water supply schemes and rehabilitation of 200 old schemes. The commitment is till end of June 2005.

Three major external agencies are active in the urban sector (DUDH) in the areas of institutional development and provision of infrastructure services. The DANIDA assisted "Urban Sector Programme Support Project", the World Bank assisted "Urban Development Project" and the ADB assisted "Urban Infrastructure Improvement Project" have the main aims of strengthening the institutional capacity and improvement of urban environment through effective and sustainable development and management of urban services.

Considerable strides have been made by way of bringing of water supply and sanitation to Bhutan's population during the past two and half decades, yet much remains to be done in terms of disease transmission and prevention. Children and women still face many risks to their health as even today the severity and incidence of diarrhoea and dysentery morbidity stands high by international standards. Questions as to the quality of drinking water supplies and how sanitary the latrine facilities are need more emphasis in tackling effectiveness of the interventions made thus far.

The process of development in the country has been very dynamic and contemplated structural changes have taken place gradually. Every preceding development plan has been a constructive lesson for the next plan in spite of multitudinous formidable coercion lying in the way of development. Reforms in institutional structure, policies, and legislation have been realized as inevitable in the process of modernization. Positive evidence lies in the fact that from the ninth five-year plan (2002-2007) period onwards, the decentralization policy strongly emphasizes the established governance at the grass-root levels to take development issues in their own hands.

1 INTRODUCTION

1.1 The Context

The country-level water and sanitation assessment for Bhutan is an analysis of data and information collected in 1999 at the country-level for the *Global Water Supply and Sanitation Assessment 2000* using the WHO/UNICEF questionnaire. This assessment is a critical review of the diverse issues of water and sanitation in Bhutan ranging from resources, policies and strategies, investments, institutions, etc. at the national level.

In this assessment, the global assessment 2000 data is reviewed and updated with available new information. It tries to clarify any ambiguities that may have existed in previous assessments including the data and information of global assessment 2000. The purpose of this assessment is therefore to review the priorities, analyze problems and make recommendations that support the on-going policy reform initiatives, and to support the development objectives within the water and sanitation sector.

1.2 The Assessment Process

An independent investigator hired specifically for this purpose carried out the writing of the assessment report. The assessment process and the content of the report reflect the opinions and views of the national inter-agency working group involved in the water and sanitation sectors of the country. The key members of the inter-agency working group are from the Public Health Engineering Section (PHES) of the Department of Health (DoH), the Department of Urban Development & Housing (DUDH), and the Department of Education (DoE). The UNICEF and the WHO acted as the advisory group in the preparation of the assessment report. The working group through suggestions, advice and criticism guided the investigator during the process of assessment.

The sources of information on water and sanitation and other related aspects were drawn mainly through official publications, past studies and reports. Some of the information was received through interviews and discussions held with stakeholders and competent authorities. Besides the key agencies stated above other agencies such as the Planning Commission, and the Central Statistical Organization were consulted frequently for validation of facts and figures and for critical comments. Their experience and recommendations are aptly reflected in the assessment report.

1.3 Water & Sanitation Services within National Strategies

One of the key steps taken by the Royal Government of Bhutan (RGoB) was the creation of Bhutan Water Partnership (BWP) in August 2001, with the decree of coordinating all programmes related to water resources management. Broadly, the mandates of BWP are to coordinate and formulate a broad water policy along with the required legislation, coordinate and prepare the Bhutan Water Vision for the next 25 years, and to coordinate and prepare water action plans and institutional linkage mechanisms for integrated water resources management. Accordingly, Bhutan's water vision states: *'Water will continue to be available in abundance to pursue the socio-economic development in Bhutan. Present and future generations of Bhutanese people will have assured access to adequate, safe and affordable water to maintain and enhance the quality of their lives.'*

A major strategic document for water use is in the making with a recent draft final issue of 'Bhutan Water Policy - March 2002'. The strategy recognizes water as a basic necessity for human sustenance and hence prioritizes water use for drinking and sanitation at the helm, followed in order of decreasing priority by water use for irrigation, hydropower, industries and other uses.

The goal of the water policy is to provide universal access to safe water and sanitation, with the allocation of the best water sources for drinking and sanitation purposes.

The PHES under the Ministry of Health and Education has taken the initiative of developing a national rural water supply and sanitation (RWSS) policy in the interest of improving the effectiveness, efficiency and impact of RWSS activities in the country. The policy draws from and builds on the draft Bhutan Water Policy guidelines, presents and describes the principles, objectives, institutional framework, roles and responsibilities and the human and financial resources required in the achievement of the RWSS vision. One of the key highlights of the RWSS policy is the continuing decentralization of responsibilities in planning, design, procurement, monitoring and post-construction support to the Dzongkhag (district) and Geog (block) levels.

1.4 National Development & Water Supply & Sanitation

The national development objectives articulated in the five-year plan documents places water and sanitation situation of both rural and urban populations as one of the central development themes. One main objective in the seventh five-year plan (1992-1997) in the water sector was to increase improved rural water supply coverage from 40% to 60%. The plan envisaged water and sanitation coverage to 90% of rural primary and community schools, monastic schools and basic health units. Further, in the achievement of balanced development of urban centres, the leading objective was in the creation of functional and sustainable water and sanitation facilities.

A review of the past performance of the seventh five-year plan activities as presented in the eighth five-year plan (1997-2002) document states that standing in the way of realization of the planned objectives were constraints such as lack of legal framework, clear policies, finance and professional resource capabilities. Thus the programmes in the eighth five-year plan for the water and sanitation sector included, besides increasing overall water supply coverage to an envisaged 80%, development of institutional capacity and the formulation and dissemination of policies and procedures for streamlining water and sanitation activities. It also envisaged strengthening of engineering units at the district level to enhance proper planning and design of rural water and sanitation schemes.

Thus, in support of the eighth five-year plan, the Department of Health in 1998 formulated a master plan for intensified rural water supply and sanitation with the cooperation of WHO/SEARO. The DUDH responsible for the urban sector planning and development in collaboration with the National Environmental Commission (NEC) initiated specific measures to protect the urban environment through formulation of urban management policies, rules and regulations to provide urban authorities to the means to control and regulate pollution sources.

A full review of the performance of the eighth five-year plan, which ended in July 2002, in the water and sanitation sector is reportedly under way but its output will not come into view until a few months from today. However, several assessments were done mid-way during the plan period by concerned departments and donors to gauge the progress and direction of the planned activities.

2. BACKGROUND

2.1 General Characteristics of the Country

Bhutan is a monarchy with the King as head of state. The Government of Bhutan consists of seven ministries and several commissions and autonomous bodies. The head of the government is headed by a minister for a one-year tenure rotated among first five ministers that receive the highest votes of nomination by members of the National Assembly. At the sub-national level, the country is administered through 20 Dzongkhags (districts) and 201 Geogs (village blocks). The administrative centres are indicated in the political map attached (Map 1).

2.1.1 Geographic Characteristics

The Kingdom of Bhutan lies in the eastern Himalayas, bounded by the Tibetan plateau in the north and the Indian plains in the south. Bhutan's total area as deduced from SPOT imagery is approximately 40,077 km^2. The demarcation in the north through a series of discussions with neighbouring China has now corrected the country's total area to 38,394 km^2. Numerous valleys formed by rivers and streams drain the catchments from high altitudes in the north to plains in the south. Within a distance of less than 175 km, the altitude drops from approximately 7,500 m to about 200 m above sea level. The climate varies strongly in relation to the altitude. The natural vegetation of the country that is determined by climatic and soil variations are zoned as: alpine tundra (above 3000 m), cold temperate forest (3000 - 3800 m), warm temperate forest (2000 - 3000 m), semi-humid subtropical forest (700 - 2000 m) and humid subtropical forest (200 - 2000 m).

Land use[1] also correlates fairly with the altitude. Forests', occupying about 72% of the area is the dominant land cover. Arable land constitutes about 7.7% of the total land. The major crops grown are rice, maize, wheat, barley, millet, potatoes, chillies and different green leafy vegetables. Oranges, apples and cardamom form the principal cash crops. Livestock rearing is also an important activity. Table 2.1 below shows the land use in terms of percentage of the total land cover.

Table 2.1 Land Use in Bhutan

Forests	Agriculture	Pastures	Settlements	Others
72%	8%	4%	0.1%	16%

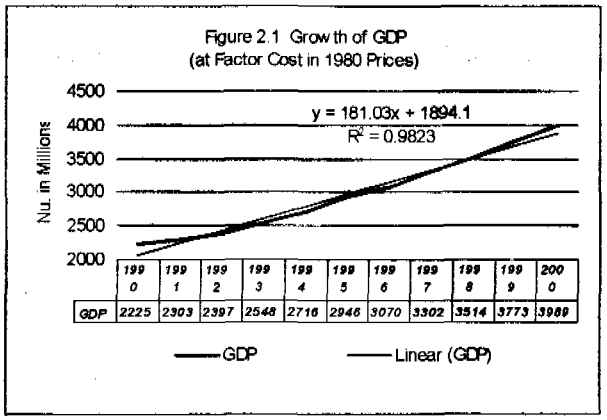
The variations in altitude and climatic conditions contribute to a rich diversity of flora and fauna several of which rare and endangered. Containing some 3,281plant species per 10,000 km^2, the country has been declared as part of one of the ten global bio-diversity hotspots. The national environmental policy is to maintain 60% forest cover for all times to come to ensure protection of its rich bio-diversity.

2.1.2 Socio-economic Conditions

While there are several language groups and communities, the country is essentially composed of two broad ethnic groups: the *Drukpas* who are mongoloid and of Buddhist faith making up 80% of the population and people of ethnic *Nepalese* origin who are mainly Indo-Aryan and of Hindu faith. The majority of the population (79%[2]) is rural and live in scattered villages, hamlets and on isolated farms mainly in the warm temperate and sub-tropical belts. The average size of rural households varies from 7 to 8.5. There is no caste system and men and women enjoy equal rights.

[1] Source: Land Cover and Area Statistics, Land Use Planning Project, Ministry of Agriculture, RGoB
[2] Source: Statistical Yearbook of Bhutan, CSO, Planning Commission, 2001

The predominant employment and income generation is through agriculture. Sources of household incomes for rural population are broadly derived from the following activities: farming, cattle or livestock, casual labour, handicrafts, remittances, and small businesses conducted during the lean agricultural season. A ten-benchmark study[3] carried out in 2000, determined rural household incomes to be very low at an average per capita income Nu.1,200 per month. Abject poverty is said not to exist in the country. Studies recently undertaken may not have been adequate to establish a poverty line for Bhutan. There are plans to improve the database, to develop a comprehensive profile in the country, a living standard measurement and a second household income and expenditure survey to establish a poverty threshold for the future.



On the macro-economic level, Bhutan has experienced gradual economic stability and growth since the country opened up to the outside world in early 1960s. The growth in gross domestic product (GDP) during the period 1990 to 2000 has been maintained at an annual average of 6% (Figure 2.1). It is evident from the sectoral contribution to GDP, that a gradual transformation of the economy is taking place. Although the contribution of rural economic activities 'agriculture' (including livestock and forestry) to GDP continues to dominate the economy, the share of manufacturing and mining, energy, and others such as construction, trade & commerce, transportation, finance & insurance etc. has increased steadily during the decade. The per capita GDP for 2000 has been estimated at US$ 1,412.00

2.1.3 Health

Malnutrition, diarrhoea and dysentery, respiratory tract infection, parasitic infections and skin and eye infections related to personal hygiene affect the general health of the people. The overall nutritional status of the population is largely affected by food shortages, exposure to adverse conditions, infections, and poor dietary habits. The incidence of acute respiratory infection is largely attributed to harsh climates, crowded rooms and smoke pollution from burning of wood fuel for cooking and space heating. Many of the diseases are linked to problems of water supply and sanitation. Over the decade, the health status of the people as gauged by several indicators as shown in Table 2.2 is seen to be improving. The growth rate of population[4] has been reported to be down from 3.1% in 1994 to 2.5% in 2000.

Table 2.2 Comparative Health Indicators

Indicators	1984[5]	1994	2000[6]
Infant mortality rate per 1000 live births	142	70.7	60.5
Maternal mortality rate per 1000 live births	7.7	3.8	2.55
Under 5 mortality rate per 1000 live births	na	96.9	84
Crude birth rate per 1000 live births	39.1	39.9	34.1
Crude death rate per 1000 live births	19.3	9	8.64
Life expectancy	48	66	na

Note: na = 'not available'

[3] Poverty Assessment and Analysis Report, 2000, Planning Commission of Bhutan
[4] Source: Annual Health Bulletin, 2000, Department of Health Services, RGoB
[5] Source: Table 28.2, Page 165, Vol. I, Main Document, Eighth Five Year Plan, 1997-2002, RGoB
[6] Source: Table 12, Page 75, Main Document, Ninth Five Year Plan, 2002-2007, RgoB
"Nu" = Ngultrum, the Bhutanese currency: ≅ Nu. 49 / US$

Bringing health care to closer to the people is an enormously hard task owing to the sparse population spread randomly across the country's mountainous terrain. Nevertheless, steady progress has been reported in the expansion and establishment of basic health care infrastructure (Table 2.3) and delivery of primary health care services covering close to 90% of the population.

Table 2.3 Growth of Health Infrastructure

	1990	1996	2000
No. of hospitals	26	26	29
No. of basic health Units (BHU)	72	97	160
No. of outreach clinics (ORC)	350	454*	447*

*Y2000 ORC figure lower due to upgradation to BHUs

The expanded programme on immunisation (EPI) launched in November 1979 extols the eradication of polio in 1986 and non-new cases of neo-natal tetanus since 1994. The coverage of the immunisation programme at the national level for 2000 is shown in Table 2.4.

Table 2.4 National Coverage of EPI

Y2000	BCG	Measles	DPT 3	OPV 3	Hep 3	TT2+
Coverage in %	93%	81%	94%	94%	92%	66%

2.2 Human Development Index[7]

Bhutan is classified as one among countries with low human development and in 2000 was ranked at 140 out of a total of 173 countries. With an HDI index of 0.494, Bhutan ranks third to Pakistan and Sudan from among 36 countries with low HDI. A summary of the basic dimensions of human development taken for Bhutan in the measurement of the HDI is given in Table 2.5 below.

Table 2.5 HDI - Bhutan 2000

Life Expectancy at birth (years) 2000	Adult Literacy rate (% age 15 and above) 2000	Combined primary, secondary and tertiary gross enrolment ratio (%) 1999	GDP per capita (PPP US$) 2000	Life expectancy index	Education Index	GDP Index	Human Development Index
62	47	33	1,412	0.62	0.42	0.44	0.494

Due to reasons arising out of inconsistency of demographic data, the HDI for the past years has not been indicated in the recent HDI report of UNDP. Hence the progression of human development in Bhutan is not possible at this stage.

2.3 Water Resources: Quantity, Quality & Management

2.3.1 Water Quantity

Surface Water

An ongoing study on water resources management plan[8] (WRMP) splits the country into three main basins having characteristic north-south zones that typify different water utilisation strategies and potentials for development. The north-south rivers are the larger rivers running from the highest mountains of the country down to the lowlands near the Indian border. Due to the location of the headwaters, melting snow and glacier melt contributes to the flow in these rivers. The second main category of rivers, designated as the east-west tributaries, include all the minor streams that flow as tributaries into the north-south rivers. These minor streams are mainly

[7] Source: Human Development Report, 2002, UNDP

[8] Source: Main Volume, Baseline Study Report, Water Resources Management Plan & Update of Power System Master Plan, Department of Power

rain-fed. In relation to water supplies to both rural and urban, the east-west tributaries are of importance.

Good records of flow have been obtained for over a decade for the north-south rivers from some 20 principal flow-gauging stations spread at suitable locations throughout the basins. Flow records are further supplemented by 12 gauging stations from different east-west tributaries and through spot measurements for lesser streams conducted annually during the lean season. Basic flow information in terms of mean annual runoff and specific minimum runoff over complete upstream catchment areas for both north-south and east-west rivers have been developed for the entire country and the data are available with the Hydrology unit of the Department of Power. The minimum specific runoffs for east-west tributaries are of interest to water supply and sanitation planning and ranges from a minimum of 4.2 l/s/km^2 to as high as 14 l/s/km^2 depending on the location.

Groundwater

A common type of landscape in Bhutan is the gently sloped farmlands formed by landslide material. Farmers living in such areas depend on springs emerging from these landslides for their domestic use. These springs can yield as much as 10 litres of water per minute. The recharge amount has been estimated at around 400 mm/year, 200 each from precipitation and from fractures (JICA,1996). Springs emerging from basement rocks are ubiquitous in mountain regions but here in the Bhutan the potential of such has not been surveyed. Areas in the foothills promise exploitable groundwater as these areas are formed from fluvial deposits in connection with present and ancient riverbeds. Groundwater in mudflow and alluvial deposits has been estimated at an exploitable rate of 3 litres/second/km^2. Groundwater wells and infiltration facilities exist in a few places in Bhutan. The southern belt of the country bears good scope for groundwater utilization as a source of drinking water.

2.3.2 Water Quality

Systematic water quality monitoring activities are new to Bhutan. Seen in global perspective, Bhutan is wholly a headwater country. Some advances have been made in water quality monitoring over the last few years, with the first initiative by the National Environment Commission (NEC) in the form of a National Baseline Water Quality Survey (NBWQS) in 1997. The survey report analysed dissolved oxygen, salinity, temperature, pH and conductivity. The PHES has also monitored some 83 samples of water from water supply sources throughout the country. However, the analytical results of these samples are not considered by PHES to be reliable enough to be included in a national database. To bring the sector interests in water quality in tune with international requirements and NEC's monitoring network, PHES has embarked on collecting water quality data from their schemes in three districts (Gasa, Thimphu and Chukha) with the intention of building up their database gradually.

The WRMP project has collected samples from around the country. The main-stem rivers have been sampled from as high up and as far downstream as practically possible and the analysis reports provide values for the following parameters: pH, conductivity, phosphorous, ammonia, calcium, magnesium, potassium, zinc and manganese.

From available data on NBWQS and the conclusion supported by assessment by WRMP, it is clear that Bhutan's rivers are highly oxygenated and consistently slightly alkaline with low conductivity and no recorded salinity. Except for BOD / COD testing being carried out in sewage treatments of two urban towns of Thimphu and Phuntsholing, there is no information regarding the state of toxic pollution of water by heavy metals, pesticides, herbicides, industrial waste

products, etc. Recent testing of wells in the south confirmed the non-existence of arsenic[9] that was feared from studying similar conditions in the neighbouring countries.

2.4 Evolution of the Sector

Formal planning in Bhutan began with the first five-year plan (1962 -1967) when the country just opened up to the outside world. The first formal planning concentrated mainly on development of road communication linking border towns with the interior to provide stimulus to development of agriculture, education and health sectors. The water supply sector began to emerge in 1974 with the start of assistance by UNICEF into the erstwhile Ministry of Development. The impetus to institutional and capacity development to water sector was formalised in 1980 coinciding with the international drinking water supply and sanitation decade (IDWSSD, 1980-1990) during which RGoB commissioned a body with members from the Departments of Public Works, Health, Education, Agriculture, Animal Husbandry, Information and Finance. This apex body was made responsible for formulation of sector policy and co-ordination of water supply and sanitation programmes in the country. With assistance from WHO/SEARO, a national master plan for the water and sanitation sector was developed and formally approved in 1984. The master plan was adopted in the country's fifth five-year plan (1982-1987).

In the eighties, the mandate of managing the water and sanitation programmes in the country was placed as unit called Public Health Engineering (PHE) under the Department of Public Works (PWD) whose main responsibility was to construction and maintenance of roads and housing. As responsibilities in the PWD grew, the water and sanitation sector with its close interrelationship with the Department of Health prompted the sector to be merged with the Department of Health in 1998. The PHES today has clearly defined and responsible role in planning and managing all water and sanitation related programmes focussing mainly on the rural population thus augmenting primary health care within the country.

The aspects of planning and implementation of urban water and sanitation programmes are looked after by DUDH. In two major towns of Thimphu and Phuntsholing, autonomous municipal corporations are established while the lesser towns of municipal bodies function under the dzongkhag administration.

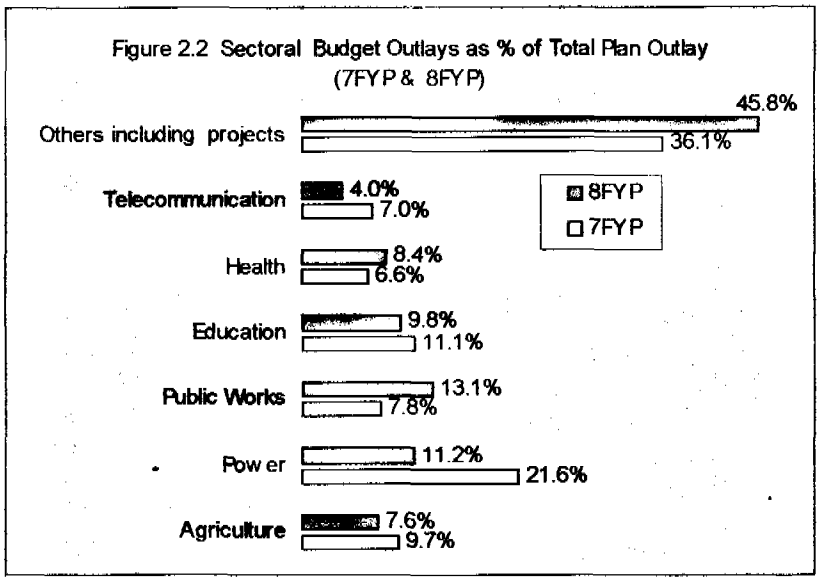
2.5 Sectoral Investment Compared with Other Economic Sectors

The gross fixed capital outlays[10] during the seventh and eighth five-year plans were Nu. 15,590.7 million and Nu. 30,151.3 million respectively. The shares of budget in several of the key sectors are indicated in Figure 2.2. The overall allocation to the health sector during the seventh five-year plan was Nu. 1,035.5 million representing 6.6% of the total outlay. The allocation to the water and sanitation sector was Nu. 373 million.

The eighth plan budget for the heath sector was more than doubled in terms of absolute value to Nu. 2,547.5 million but its share in the total outlay was up by about 2% only. The eighth five-year plan included many infrastruture projects in all the sectors including in the health sector where older hospitals and basic health units were rehabilitated and new facilities gearing to primary health care were expanded . Water and sanitation programmes occupied an approximate 2% of the total programme budget laid for eighth five-year plan activities.

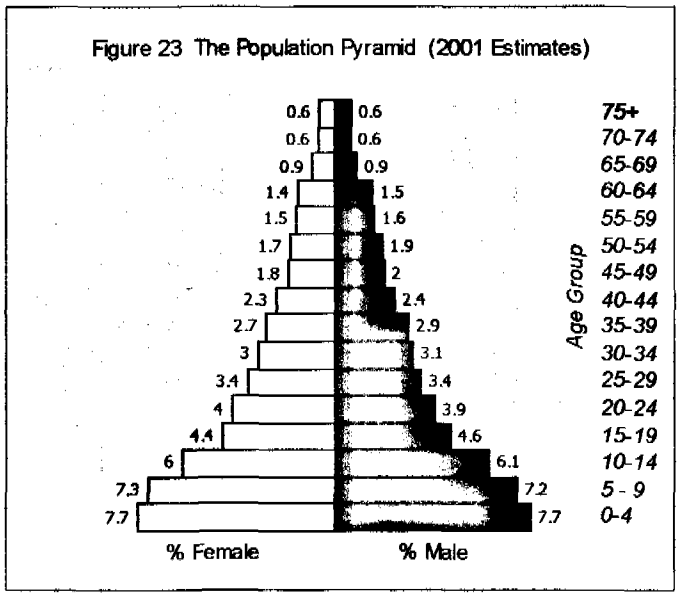
[9] Report of Arsenic Detection Test, Phase 1 & 2, PHES/ UNICEF, April 2001.

[10] Source: Page 183, Statistical Yearbook of Bhutan - 2001, Central Statistical Organization, Planning Commission, RgoB.



2.6 Population

National population censuses were undertaken in Bhutan in 1969 and 1980. The population figures in those years were large because of large migrant population from neighbouring countries. The 1994 national health survey based on which the population figures have been officially amended assesses the average population growth rate close to 3.1%. Until the next round of census scheduled for 2005, the estimate of population provided below stands as the most current official figure.



The estimated population[11] of Bhutan in 2001 was 698,950, with a male:female ratio of 1:0.98. The population under 15 was 42.1% and that over 65 was 4.3%. Population estimates for the year 2001 by age and sex are segregated in the pyramid shown in Figure 2.3. The pyramid is typical of an developing nation.

The child dependency and old age dependency ratios stood at 78.5% and 8% respectively. The distribution of urban[12] and rural population has been estimated at 21% and 79% respectively.

[11] Source: Statistical Yearbook of Bhutan - 2001, Central Statistical Organization, Planning Commission, RGoB. Note: The estimate is based on population growth rate of 3.1% over NHS, 1994

[12] Source: 9FYP Background Paper, Department of Urban Development and Housing, Ministry of Communications.

3. INSTITUTIONAL STRUCTURE

3.1 WSS within National Institutional Structure

The national institutional structure is composed of seven ministries in the affairs of home, finance, agriculture, communication, trade & industry, health & education and foreign affairs. They are inter-linked to several institutions that are related to policy formulation, enactment, and long-term planning. The water supply and sanitation sector responsibilities of the country are shared between PHES of the Health Department under the Ministry of Health and Education, DUDH under the Ministry of Communication, and Dzongkhag administration under the Home Ministry.

3.2 Institutional Framework of the Sector

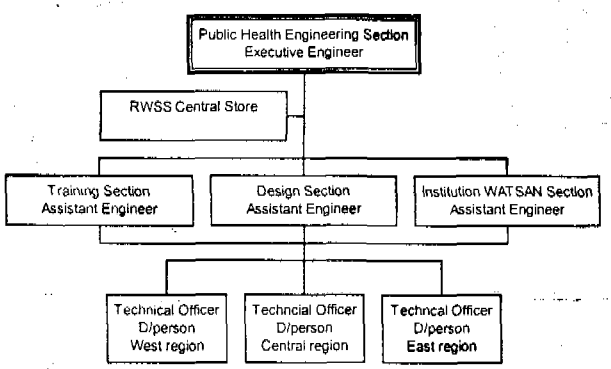
3.2.1 Department of Health

The Department of Health under the Ministry of Health and Education is responsible for planning, directing and monitoring health care activities in the country. The Department is responsible for policies, procedures and materials for health education and community participation in health care delivery including water supply and sanitation. The Department monitors the progress of the districts in their programme implementation regularly and through an annual health meet. There are five functional divisions under the Department of Health as indicated in Table 3.1 below.

Table 3.1 Functional Divisions of the Department of Health

Department of Health				
Drugs, Vaccines & Equipment Division	**Health Care Division**	**Public Health Division**	**Health Engineering Division**	**Information, Education & Communication for Health Division**
Procurement of drugs, non-drugs, hospital and laboratory equipment; repair and maintenance	*Hospitals, quality assurance, continuing education, traditional medicine services, nursing services, laboratory services*	*Information, epidemiology and research, communicable diseases, non-communicable diseases, public health laboratory*	*Public health engineering, planning & design, construction, projects coordination*	*Advocacy and social mobilization, design and production, communication support of programmes / projects*

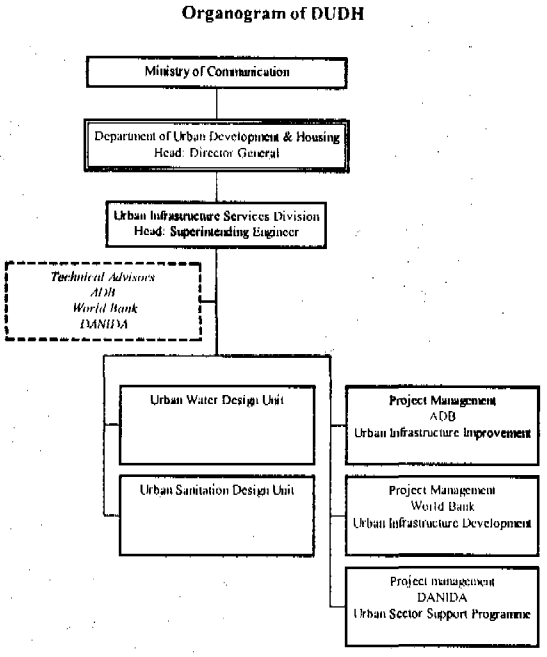
Organogram of PHES



PUBLIC HEALTH ENGINEERING SECTION (PHES)

The PHES is mainly responsible to coordination and management of rural water supply and sanitation (RWSS) activities. This institution thus carries out functions such as planning of programs, design of water supply and sanitation systems, training in water and sanitation activities. There are three functional units under PHES responsible for individual activities described above. The institution WATSAN section coordinates water supply and sanitation programmes in schools and besides also provides technical advisory support to monasteries. Responsible support units broadly divided into three regions of the country in terms of work allocation function interactively under the three sections. Further, a central store for storing and handling RWSS materials is also functional under to the PHES.

3.2.2 Department of Urban Development & Housing (DUDH)



The mandate of the DUDH is to focus on urban development encompassing the issues of housing, infrastructure provision and municipal management. Under the DUDH is an urban infrastructure services division responsible for planning of programmes, survey and design of urban infrastructure for 28 declared towns and 26 satellite towns. Included within the responsibility is the planning and implementation of urban water supply and sanitation activities of all towns.

As is clear from the organogram, the urban infrastructure services division is mainly responsible for steering various infrastructure improvement and development programmes principally under loan and grant funds from external agencies such as the ADB, the World Bank and the government of Denmark. The larger towns of Thimphu and Phuntsholing have autonomous city corporations established but yet receive the support of DUDH under various project funding. The remaining other towns have municipalities functioning under the Dzongkhag administration but the activities of water and sanitation in these towns are planned and implemented through DUDH.

3.2.3 Dzongkhag Administration

The Dzongda (District Administrator) heads the Dzongkhag administration at the district level. All districts have a district engineer responsible for public works and irrigation and including water supply and sanitation, a district education officer, a district medical officer, a district health supervisory officer, a district animal husbandry officer, a district agriculture officer, and a rural credit officer.

3.3 Modalities of Organization

The draft Bhutan Water Policy laments the weak functional linkages at policy, planning and programming levels amongst the existing water user institutions. These different institutions have been performing their respective responsibilities independently without any inter-agency consultations. The water policy reflects the acute need for coordinated efforts on all water resources development and building an institution for integrated approach in the management and sustainable utilization of water. The integrated approach is planned to take into effect once the envisaged Ministry of Energy and Water Resources is established. In line with the decentralization policy, the district development committee (DYT) and the block development committee (GYT) at the district (Dzongkhag) and block (Geog) levels are expected to play more important roles in planning, implementation, operation and management of all development programmes.

3.4 Mechanism of Programme Implementation.

In the early years, the rural water and sanitation schemes were executed through a self-help process of free labour (*shapto-lemi*) by the communities that would receive the direct benefits. Upon receipt of policy directives from the central government agencies in the capital, the district administration would select appropriate local schemes for implementation for inclusion in the

next five-year plan. It was then primarily a top-down process, with very little community involvement in decision-making.

The functions of identifying and prioritizing development needs of the people are carried out at the geog level but reviewed and further prioritized at the Dzongkhag level during the DYT. The development exigencies of the Dzongkhags are forwarded to the Ministry of Home Affairs and in turn to the Planning Commission. Depending upon the resources available, the proposals are prioritized and included in the planned budget and later into the annual implementation plan.

In terms of drinking water supply and sanitation, field surveys and preliminary data collection are done at the district level by the Dzongkhag engineering staff. In the RWSS survey, the district staff along with the Geog representatives engages the commitment of the people in formation of a village water maintenance committee. The designs and cost estimates are prepared and finalized by the PHES at the central level. Once the designs and the estimates are finalized by PHES, the PHES embarks upon the procurement of non-locally-available materials which are transported to concerned dzongkhags through their central store based at Phuntsholing. The communities that contribute labor and local materials do the implementation of the RWSS. The Dzongkhag engineering staff carries out supervision and monitoring activities. A village water care-taker is appointed by the village water maintenance committee.

At the implementation levels, all consumptive water dealing institutions work closely with the Dzongkhag administrations. The urban water supply and sanitation activities of the DUDH also follow the same procedure as in the case of RWSS. The only difference is that their works are usually tendered out and implemented by construction companies.

3.5 Recent, Ongoing and Planned Sectoral Reforms

In the past, the approach of the RWSS was target and achievement oriented but this resulted in the sacrifice of quality of the implemented schemes. Since the seventh five-year plan, the approach was altered to gear to quality implementation rather than quantitative outputs. The water and sanitation sector received a considerable stimulus in 1992 when a royal decree was issued urging every household to construct and use, at least, a simple pit latrine. The decree also reaffirmed that the primary responsibility for operation and maintenance of the rural water supply schemes is with the users. . RWSS schemes in Bhutan are subsidized heavily. In 1993, the RGoB decided to do away the subsidies in the area of household latrines in view of long-term sustainability. In lieu, strong emphasis was placed on advocating awareness of safe drinking water and sanitation practices for the rural population.

Following the decentralization policy, the sectoral policies of both PHES and DUDH was to gradually shift roles from that of implementing agency to that of an effective facilitator. Thus during the eighth five-year plan, the strategies in the water sector were to promote human resource and capacity development at the Dzongkhag level.

In the urban water supply sector, water tariffs on actual consumption were introduced in 1996 in the main towns of Thimphu and Phuntsholing. Later similar charges were also introduced in additional four towns.

The 80th session of the National Assembly (June 25 to July 29, 2002) introduced a new era in the field of local governance. The assembly ratified the GYT statute that grants unprecedented regulatory, administrative and financial powers to the GYT. The GYT will now identify and formulate development activities with technical backstopping and advisory services provided by the Dzongkhag. This decentralization exercise is seen as a means of supporting and ensuring balanced and equitable development.

Further, the planned evolution of a Ministry of Energy and Water Resources by some time in 2003 is envisaged to create a unique system of managing the country's water resources.

4. SITUATION OF THE DRINKING WATER & SANITATION SERVICES

4.1 Water and Sanitation Data Sources

The national data on water and sanitation in Bhutan are categorized according to the assignments of two key sector organizations, viz. rural by Public Health Engineering Section (PHES) of the Department of Health and urban by Department of Urban Development and Housing (DUDH). Further, supplements of data are available through the basic health units and district hospitals that update their own statistics for a host of health and hygiene related information including water and sanitation. The Central Statistical Organization (CSO) under the Planning Commission avails the resources from these sectors for publication in their annual production of Statistical Yearbooks.

4.2 The Rural Water Coverage

There is noticeable differences in the annual rural water supply coverage data as reported by the different sources. The differences are naturally anticipated as is explicated by the fact that coverage percentages are expressed either in terms of population or in terms of households, depending on the practice followed by the concerned sectors. Further, data assimilated during the course of reviews of programmes, special studies, and the kinds of sampling routines create variance in resulting data..Without doubt, in all the sources, the biggest upsetting factor for calculating the percentage coverage in years prior to 1994 had been the unsettled demographic data, but noticeable convergence of data is apparent after 1994 when the country's demography was gradually getting validated.

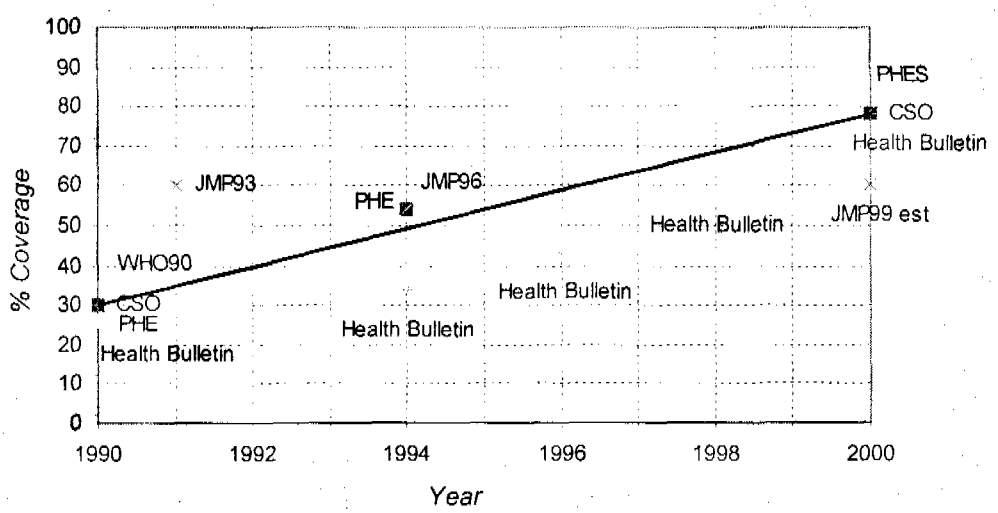
The data for rural water supply coverage from PHES are a result of the survey conducted prior to the implementation of the programme and is primarily a design data necessary to match water demand and supply technicalities. Population counts of the targetted beneficiaries and the projections thereof made to match the system design within an area of focus characterizes their data type. Rural water supply schemes implemented by PHES also cover some urban areas, notably the satellite towns, and as such will have influenced the reliability of the reported rural water supply coverage figures. However, the present day statistics of CSO uses the coverage data reported by PHES as being the best estimate of rural water coverage at the national level.

The basic health units and hospitals around the country also gather and integrate data in preparation for the annual National Health Bulletin. Their statistics are based on counts of households served by piped drinking water. No attempt is made to know whether the piped system is privately installed or installed by PHES or by various other sources. Also too, the number of households served by a particular health unit will not tally with the official records maintained under home minsitry regulations. Often enough health satistics will include counts of households that are temporarily settled in that area and who avail the free facilities of the health unit. Examples are camps set up along roadsides for road repair and maintenance and families settled in relation to specific projects upcoming in that area.

The data congregated in preparation for the global water supply and sanitation assessment 2000 report using the WHO/UNICEF questionnaire have been derived through a reconciliation of figures reported by the various above sources. These figures have been scrutinized for ambiguities and updated with recent data, wherever possible, in consultation with the agencies concerned. The rural water supply coverage figures as reported by various sources is shown in Figure 4.1. The figures reported by the Health Bulletins are lower than figures reported by the rural water sector (PHES of the Department of Health which prior to 1998 was PHE under Public

Works Department) as because the Health Bulletin data includes populations outside the targetted beneficiaries that are the permanent residents in the locality. Except for the outlier data, JMP93, and the 2000 coverage estimated during JMP99 review, the data of PHE and PHES are those officially quoted by the Central Statistical Organization (CSO) under the Planning Commission.

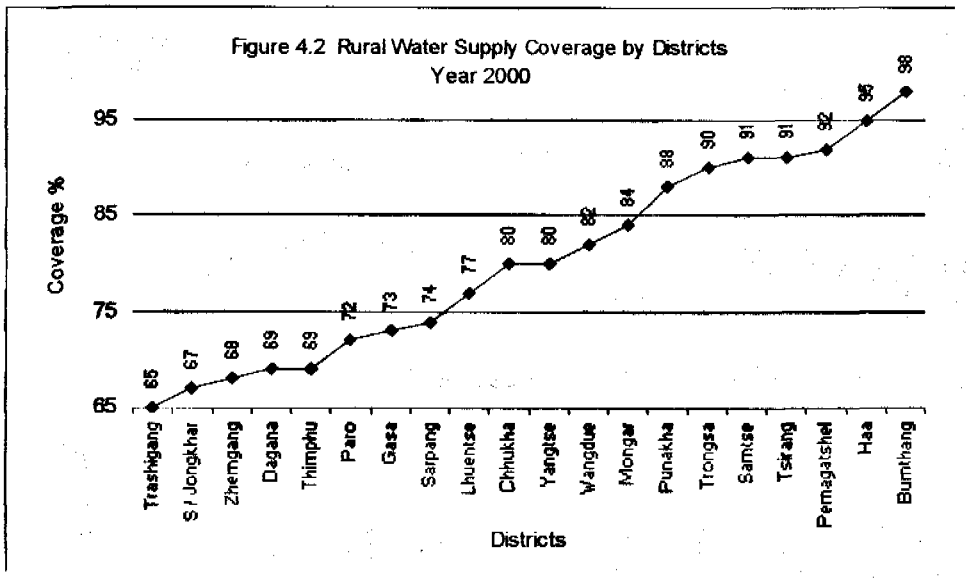
Figure 4.1 National Rural Drinking Water Supply Coverage (%)
(as reported by various sources)



Within a decade, the national average rural water supply coverage had expanded from 30% in 1990 to 78% in 2000 in terms of numbers of households. The year 2000[13] coverage represents a total of 2,359 water supply schemes, 987 spring protections and 664 rehabilitated schemes in total serving an estimated rural population of 415,000. The average number of households covered by a rural water supply scheme is around 18, representing an approximate population of 150 heads. Springs provide about 3 households on average whilst old rehabiliated schemes cover an average of about 25 households. Based on the envisaged trend of rural water supply coverage shown in Figure 4.1, the average annual growth during the last decade in terms of implementaion of water schemes is about 4 to 5%.

Variations exist in the coverage of rural water supply among the 20 districts ranging from a low of 65% to as high as 98% for the year 2000, as shown in Figure 4.2. Low coverage is evident in some of the populous districts such as Trashigang, Samdrup Jongkhar, and Sarpang and also in some lesser districts such as Gasa, Zhemgang and Dagana that are characterized by remote and highly dispersed populations. The case of Thimphu and Paro in the low coverage class probably reflects sub-urban migrant settlers from other parts of the country that have not been accounted by rural water schemes of PHES but may very well have their own water supply schemes.

[13] Source: Rural water and Sanitation Sector Policy; Background Information Document, June 2001, PHES



A tentative water supply coverage classification is made as given in Table 4.1 where the 20 districts of the country are categorised as low, medium and high water supply coverage areas based on 2000 coverage data. The tentative classification has been made for the purpose of projecting the variance of the water coverage in "Map 3" attached. The distribution of population by districts is also provided in the table in accordance with the water supply classification. Higher populations exist in areas where the water supply coverage is low and this may be accredited to the remote and dispersed nature of populations in those districts. On the contrary, the high water supply coverage districts are characteristic of low population densities with at least 6 out of 7 districts with population distribution under 5% (the mean district % population of the country). The highest water supply coverages in the districts of Bumthang and Haa have had the added advantage of having more clustered villages in relation to other districts.

Table 4.1 **Percentage District[14] Population, 2000 by Rural Water Coverage Classification**

Low Water Coverage <75% coverage			Medium Water Coverage 75% to 85%			High Water Coverage >85% coverage		
	Districts	% Population		Districts	% Population		Districts	% Population
1	Trashigang	10.52	1	Lhuentse	3.17	1	Punakha	3.94
2	S / Jongkhar	7.52	2	Chhukha	7.21	2	Trongsa	1.82
3	Zhemgang	3.15	3	Yangtse	4.41	3	Samtse	9.49
4	Dagana	4.20	4	Wangdue	5.29	4	Tsirang	3.74
5	Thimphu	9.51	5	Mongar	8.27	5	Pemagatshel	3.00
6	Paro	3.54				6	Haa	1.94
7	Gasa	1.03				7	Bumthang	1.91
8	Sarpang	6.34						
46% population			28% population			26% population		

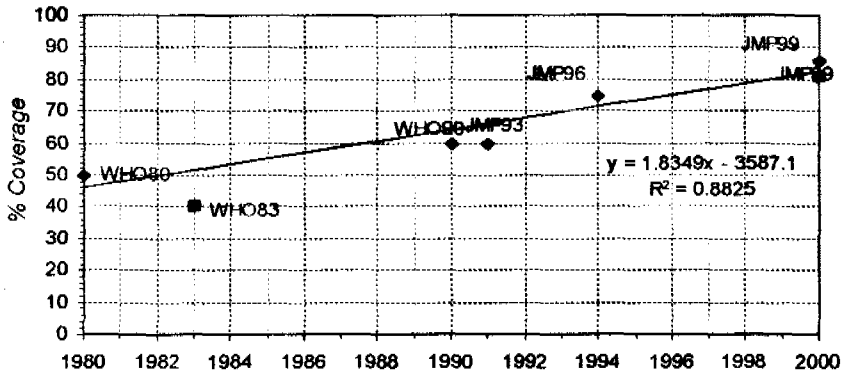
4.3 Urban Water Supply Coverage

The data of WHO / UNICEF in the preparation for the global water supply and sanitation assessment 2000 report provides as assessment of urban drinking water supply coverage as shown in Figure 4.3. The coverage data was largely drawn through the DUDH but the figures are not representative of all 54 settlements designated as 'urban' in the country. Data for the year 2000 represents coverage of urban water supply for 28 towns only. The lesser 26 satellite towns are

[14] Source: National Health Survey, 2000

covered within the RWSS programmes. The coverage data is affected by the fact that the pace of urbanization is increasing rapidly due to a growing tide of migrants from rural areas. It has been estimated that by around 2020 close to half of the population will be living in urban areas.

Figure 4.3 Estimates of Urban Drinking Water Supply



The annual coverage of urban water supply based on a best-fit linear plot of the existing data indicates coverage growth rate of about 2% annually. The projected annual percentage urban water supply coverage from 1990 to 2000 is provided in table 4.2 below.

Table 4.2 Estimate of Urban Drinking Water Supply Coverage

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
% Coverage Est.	62	63	65	67	69	71	73	75	77	79	81

4.4 Water Quality

4.4.1 Monitoring of Water Quality

In 1997, the National Environment Commission (NEC) conducted a national baseline water quality survey (NBWQS). During this survey 28 samples were taken from major rivers close to the east-west lateral road. These samples were supplemented by a number of samples from high alpine areas across northern Bhutan. The sample stations close to the lateral highway were re-sampled in 2000. These quality tests were in-situ measurements of four basic parameters: dissolved oxygen, conductivity, temperature and pH. The NBWQS water quality data analyzed Bhutan's rivers to be highly oxygenated, consistently alkaline with low conductivity and no recorded salinity.

The Public Health Laboratory (PHL) in Thimphu undertakes both bacteriological and chemical tests of drinking water. PHL acts as the reference laboratory for 20 laboratories at district hospitals and a few basic health units. Although the main function of the district hospitals is to conduct clinical tests, at least 12 laboratories are equipped to conduct bacteriological testing of water samples. None of them, however, have the capacity to analyze water samples for chemical parameters.

The PHES in cooperation with the only Public Health laboratory (PHL) conducted a pilot study to assess the chemical and bacteriological drinking water quality from September 2001 to February 2002. A total of 50 schemes from 3 districts were tested. Based on the pilot exercise, the PHES is now defining a water quality-monitoring programme in rural water supplies.

A Norwegian funded project on water resources management plan (WRMP) and update of the power system master plan (PSMP) within the power sector collected approximately 50 samples from various rivers from October 2001 to February 2002. The samples were submitted to the Soil and Plant Analytical Laboratory (SPAL) of the Ministry of Agriculture for chemical parameters. The chemical analysis of river water quality from various sampling spots indicated that on a macro-scale, the rivers and their major tributaries, with some exceptions, are virtually of a pristine stage water quality state with no apparent tendency of heading into a eutrophic direction.

Except for BOD/COD testing being carried out at Thimphu and Phuntsholing sewage treatment plants, there is no information regarding the state of toxic pollution of water by heavy metals, pesticides, herbicides and industrial waste products.

4.4.2 Water Quality Standards

The NEC published in 1999, a set of environmental quality criteria and industrial discharge standards for Bhutan. These criteria include criteria for drinking water supplies. The guideline values for chemical drinking water quality were mainly based on the Canadian water quality guidelines but WHO, EU and Indian standards were also taken into consideration. The bacteriological criteria were taken directly from the WHO guidelines. For drinking water criteria the differences between the four guidelines / standards are in most cases small. However, in the case of arsenic, the maximum acceptable concentration recommended by NEC is five times higher than the WHO guidelines.

The criteria drawn up by NEC are still to be considered as guideline values as it is envisaged that these guidelines will be further developed into an appropriate environmental quality standards during the ninth five-year plan (2002-2007).

4.4.3 Drinking Water Quality

The pilot study[15] by PHES and PHL in the assessment of chemical and bacteriological drinking water quality suggested the chemical composition of drinking water to be well below the guideline values recommended by WHO. The test results from sampled schemes are shown in Table 4.3. The indicator used in the above study for the bacteriological quality of samples was the faecal coliform bacteria and the risk classification done in accordance to WHO standards as given in Box 4.1.

Box 4.1 WHO Classification of Bacteriogical Water Quality

Thermotolerant Coliform per 100 ml CFU/100ml	Risk Classification
0	In accordance with WHO guidelines
1-10	Low rsik
10-100	Intermediate risk
100-1000	High risk
>1000	Very high risk

The pilot test observed that a significant number of drinking water supplies from spring schemes were in accordance with the WHO guideline value of 0 or fell in the low risk group. It reported 86% of spring schemes with thermotolerent coliform below 10 CFU/ml as against 38% only in the case of sampled stream schemes.

[15] Source: Report from water Quality Expert, Institutional Aspects of Water Quality Monitoring, RWSS Component, May 2002.

Table 4.3 Chemical and Bacteriological Test Results ; PHES / PHL
September 2001 - February 2002

PROJ-NO	Scheme Name	Source type	Sample date	Source Faecal Coliforms SFC CFU/100mL	Tapstand Faecal Coliforms CFU/100mL	Household Feacal Coliforms CFU/100mL	Ph	Conductivity µS/cm	Temp. °C	Turbidity (NTU)	Iron (mg/L)	Sulphate (mg/L)	Fluoride (mg/L)
00/42/04	Zomgang	SP	30/01/02	0	0	4	7.43	138	11	0	0.05	0	0
00/42/06	Rinchenling	SP	09/02/02	0	0	0	8.44	141	9	10.7	0.4	0	0.03
00/42/09	Upper Burkhey	SP	02/02/02	0	16	12	8.22	245	17	0.35	0.08	0	0.01
81/42/08	Torlbari	SP	04/02/02	11	8	10	8.46	700	19	0.32	0.05	65	0.16
83/42/07	Minichim	ST	30/01/02	4	0	1000	7.06	64	16	2.44	0.03	0	0.03
87/42/03	Bunakha	ST	29/01/02	8	0	0	6.63	44	13	2.78	0.05	0	0
87/42/05	Damdara	SP	05/02/02	0	0	0	8.16	289	17	0.13	0.08	8	0.04
93/42/01	Semakha	SP	26/01/02	0	0	0	8.3	62	5	0	0.13	13	0.03
98/42/01	Tshimakha	ST	28/01/02	7	4	1	7.47	24	9	2.8	0.08	0	0.01
98/42/08	Labana	SP	18/02/02	0	0	0	8.48	155	14	0	0.08	0	0.01
98/42/11	Upper lobnekha	SP	27/01/01	0	0	0	7.78	28	9	0	0.03	0	0.05
99/42/01	Gurung Dangra	ST	01/02/02	0	0	1001	7.23	49	19	0.17	0.03	0	0.02
99/42/02	Lower Burkhey	SP	02/02/02	1	5	20	8.07	513	18	0	0.1	0	0.03
99/42/04	Singya	SP	31/01/02	2	4	25	7.83	413	17	0	0.13	0	0.02
99/42/06	Kothline	SP	16/02/02	0	12	12	8.21		18	1.12	0.05	0	0.03
99/42/08	Alay	SP	03/02/02	0	0	0	7.94	351	20	2.08	0.1	0	0.04
99/42/09	Goney	SP	08/02/02	0	0	0	8.08	61	8	0.21	0.1	0	0.07
99/42/10	Tongsegang	SP	29/01/02	103	75	80	7.24	40	13	0	0.03	0	0
99/42/11	Gonglin	SP	08/02/02	0	0	0	8.14	54	8	0	0.05	0	0.04
99/42/12	Pakshikha	SP	30/01/02	4	1	3	6.89	30	11	0.16	0.1	0	0.01
70/35/02	Lhanikha	SP	03/12/01	0	0	48	7.79	83	11	0	0.18	0	0
81/35/09	Gasa jr high	ST	04/12/01	0	0	1	6.65	207	14	0	0.08	0	0.04
81/35/10	Choli	SP	01/12/01	1	0	1	8.25	790	10	0	0.1	0	0.02
81/35/11	Mani	SP	01/12/01	2	1	1	7.68	74	14	0	0.08	0	0.03
81/35/13	Damji	SP	06/12/01	0	0	0	6.3	78	13	0	0.03	0	0.04
81/35/14	Yemina	SP	07/12/01	0	2	0	6.64	99	13	0	0.03	0	0.03
84/35/05	Tshenikha	SP	02/12/01	0	2	0	8.07	54	10	0	0.13	0	0.06
84/35/06	Jabisa	SP	06/12/01	0	0	2	6.81	29	10	0	0.03	0	0.02
87/35/01	Baychu	SP	04/12/01	0	1	2	7.63	100	12	0	0.05	0	0.06
98/35/01	Barsha	SP	07/12/01	0	0	0	7.67	197	11	0	0.03	7	0.02
00/45/01	Tango Monastry	SP	16/11/01	0	12	13	7.95	28	10	0	0.03	0	0.08
00/45/03	Siluna	ST	06/09/01	26	1	1	8.58	79	20	0.45	0.12	3	0
00/45/04	Jimina	ST	04/09/01	39	48	160	7.85	68	20	2.92	0.05	0	0
00/45/05	Wonjokha	SP	15/09/01	106	1000	1000	7.12	175	25	0.86	0.06	0	0.07
00/45/07	Lower Hongtsho	ST	20/09/01	21	29	1000	7.53	22	16	0.87	0.03	1	0.01
0045/09	Siludraphu	ST	03/09/01	53	101	85	7.54	112	19	2.01	0.08	0	0
70/45/04	Ziilukha pry school	ST	03/10/01	26	23	27	6.83	15	18	2.11	0.25	0	0.05
78/45/02	Mendegang	SP	17/09/01	4	7	0	7.56	79	22	0.97	0.09	0	0.06
78/45/10	Dechencholing jr high	SP	17/11/01	0	0	7	7.38	34	14	0.2	0.15	1	0.06
81/45/05	Gemkha	ST	17/09/01	1000	1000	1000	7.5	46	20	5.19	0.35	0	0
91/45/10	Thinleygang BHU	ST	14/09/01	165	82	66	6.63	33	21	6.48	1.58	1	0.02
92/45/02	Dechencholing BHU	SP	04/10/01	0	0	0	7.77	80	18	2.93	0.73	0	0
97/45/01	Langdu	SP	07/09/01	54	14	0	7.75	256	20	2.94	0.07	0	0.01
98/45/02	Changdagang	SP	19/11/01	0	0	0	7.35	43	13	0	0.05	0	0.04
99/45/03	Chokaar	ST	15/11/01	4	13	69	7.85	20	16	2.02	0.05	0	0
99/45/11	Jalu Thamzana	ST	19/09/01	53	18	39	7.3	31	20	1.73	0.06	0	0.14
99/45/12	Pheuntokha	SP	19/09/01	0	0	64	6.45	64	20	0	0.03	1	0.03
99/45/16	Nyenzerkha	SP	10/09/01	12	14	0	7.41	94	20	1.13		1	0.02
99/46/17	Pulana	ST	04/09/01	50	100	85	8.18	112	19	1	0.1	0	0

4.4.4 Arsenic Tests

Arsenic has been a major concern for people in neighbouring India, and Bangladesh where the groundwater water sources have been detected with considerable amounts of arsenic with values above risk-free limits. Although arsenic poisoning has not been reported in Bhutan, precautionary tests were carried out between March and April, 2001, by PHES/PHL[16] with the support of UNICEF in a few selected areas, notably in the southern belt, where some of the drinking water is drawn through groundwater and sub-surface (infiltration) sources. The results of all the sampled tests indicated that arsenic is not a major risk at the moment. The present plans include the setting up of a regular arsenic and heavy metal monitoring unit under the auspices of the Bhutan Water Partnership in collaboration with all the consumptive water user agencies in the country.

4.5 Drinking Water Treatment

The RWSS and also the urban water supplies depend on district hospitals for mainly bacteriological tests on their drinking water. Except for the PHL in Thimphu, the regional hospitals around the country are not fully equipped for complete chemical tests and besides are constrained in terms of qualified chemists. Portable testing kits exist at regional hospitals but their

[16] Report of Arsenic Detection Tests, Phase I and II, March – April, 2001. PHES / PHL / UNICEF.

state of condition in many of the cases are in deplorable state either due to lack of proper maintenance or due to lack of timely refurnishment of reagents necessary for testing. Regional hospitals have just one chemist each and hence there is the difficulty to spare his or her time for walking to various RWSS sites collecting and testing water samples.

At the moment, none of the rural water supplies are treated unless peculiar cases of epidemic proportions warrant such an action to be undertaken by the regional hospitals. In the absence of treatment systems, the village water maintenance committee and the caretaker are trained by the Dzongkhag engineering staff on the importance of protecting their sources from encroachments, both human as well as cattle. The caretakers' responsibilities are towards regular cleaning of the water system from sand and sediments, leaf litter and other materials that come in the way of water flow.

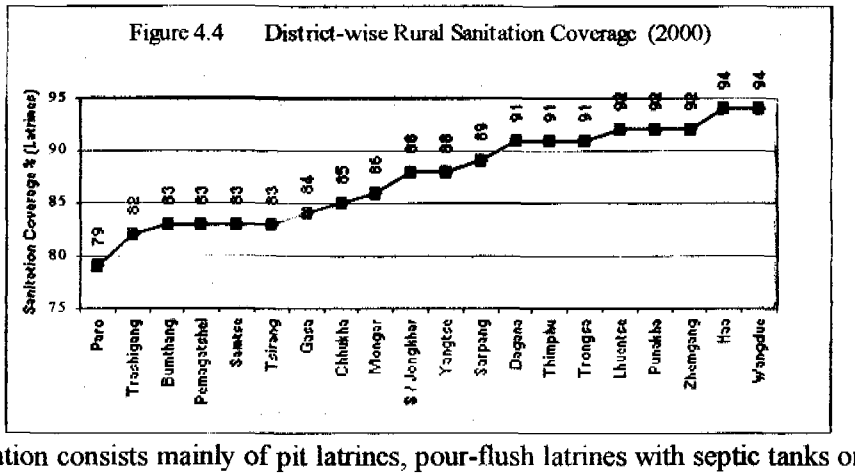
Out of the 54 settlements designated as urban centres, 28 are the so-called active towns where water supply developments have been or are presently being implemented. The status of the 28 towns in terms of water treatment is: 6 towns have treated water supply schemes of basic standard, 12 towns are or will soon be served with treated water, and 10 towns are still served from rural water schemes or rely on rudimentary water services.

4.6 Sanitation Coverage : Rural & Urban

Rural household sanitation coverage in terms of latrines constructed has accelerated during the last decade, mainly as a result of the royal decree in 1992 that mandated very household to maintain a latrine. It must be mentioned here that a major policy decision was taken by RGoB in 1993 in which subsidies for rural household latrine construction was terminated in view of long term sustainability. This decision ended several years of dual approach of promotion of sanitation activities: improved latrines by PHE then under PWD and simple pit latrines by the health sector. The data post-1994 is primarily that derived from the basic health units and hospitals as compiled in the annual health bulletins.

A tentative water rural sanitation coverage classification is made where the 20 districts of the country are categorised as low (<80% coverage), medium (between 80 to 90% coverage) and high (>90% coverage) sanitation coverage areas based on 2000 coverage data. The variance in sanitation coverage is indicated in "Map 4" attached. The rural sanitation coverage data of 2000 shown by districts is indicated in Figure 4.4

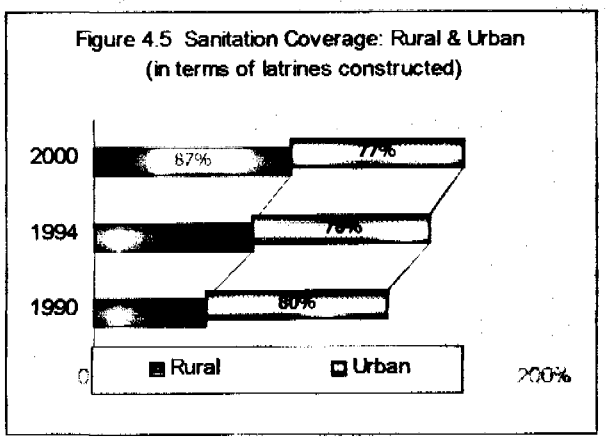
Figure 4.4 District-wise Rural Sanitation Coverage (2000)



Urban sanitation consists mainly of pit latrines, pour-flush latrines with septic tanks or long-drop latrines. The urban centres of Thimphu and Phuntsholing are partially sewered in the core areas and have oxidation ponds for treatment of sewerage with regular monitoring of BOD, COD,

dissolved oxygen and suspended matter. For other towns, sewerage systems or low-cost technologies are being investigated by DUDH.

The data compiled for global water and sanitation assessment report 2000 contains estimates (WHO90, JMP93, JMP96, and JMP99) of rural sanitation coverage but arguably are very low figures as compared to those of UNICEF, PHES and the health bulletins. The UNICEF/PHES field offices' best estimate in 1990 was 50% in terms of latrines constructed which is in sharp contrast with 3% as reported in WHO90. Similarly, what went up to 66% by mid-1994 by PHES estimate, the figure reported just 18% by JMP96. Thus the estimation of sanitation coverage here relies on the data of UNICEF, PHES and the health bulletins which are in close agreement with each other.



The urban sanitation coverage reported for 1990 was 80% (WHO90), and by 1994 the coverage dropped to 66% (JMP96) and further down to 65% in 1999 (JMP99). The drop in urban sanitation coverage reflects the rapid growth of urbanization affected by rural to urban migration and the boom in the construction sector. Sanitation statistics reflecting only the registered urban residents show urban sanitation coverage to be up to 90%[17] in 1994 and 88%[18] in 2000. The mean values of the reported urban sanitation coverage are used here and the comparative urban-rural sanitation coverage projection is shown in Figure 4.5.

4.7 Waste Treatment

Two urban centres of Thimphu and Phuntsholing have sewerage treatment systems covering some 60% and 80% of the households respectively. Both were constructed in 1996 under the DANIDA support to urban development. The households that are not connected to the sewerage system rely on individual septic tanks and the contents are emptied into the main sewerage network through the facilities provided by the city corporations. Otherwise, wastewater treatment is virtually non-existent in the country. It has been planned that some 11 urban centres will have the provision of mobile septic tank cleaning systems. Thimphu has the only solid waste management facility in the country. Solid waste landfills are planned to be developed in 10 urban centres under the World Bank programme and 2 under DANIDA support.

There are two main recipients of effluents and pollution load in the country's waste water management context. The ground absorbs the bulk of the household and small-scale industrial waste water through soak-away septic tanks or mainly direct infiltration from the surface. The main rivers are the final recipients and conveyors of all waste materials. There are no lakes, stagnant bodies or natural wetlands that receive significant effluents creating retention of waste water pollutants.

4.8 Operation & Maintenance Systems

4.8.1 Rural Water Supply

[17] Source: Bhutan Water Supply & Sanitation Sector Master Plan, WHO/SEARO, SEA/EH/520, 1999
[18] Source: Ninth Plan Main Document (2002-2007), Planning Commission, RGoB

The existing approach for operation and maintenance for rural water supplies is to transfer the responsibility to a village water committee (VWC) after the project is completed. The VWC appoints village water caretakers (VWCs) who are responsible for the upkeep of the system. The PHES plays a supportive role by training Dzongkhag staff who in turn train the VWC and the VWCs in repair and maintenance aspects. A plumber's kit is thence provided after the training. The VWC decides the level of user fees to be paid by each beneficiary household. The VWCs are paid cash incentives out of the collected user fees or are paid in kind for their share of contribution. Spare parts and materials not available locally are purchased from the market out of the user fees.

Drinking water is a heavily subsidized sector. The rural community bears approximately 10 to 20% of the cost of construction of water supply schemes through contribution of unskilled labour and provision of local construction materials such as sand, gravel and wood. The cost of transportation of water supply materials from the nearest road-head to the beneficiary village is also borne by the community. Except for a very nominal water use fee, the beneficiaries do not pay for water use by consumption.

4.8.2 Urban Water Supply

The urban centres are administered under the purview of the municipal act. The larger towns of Thimphu and Phuntsholing have autonomous city corporations whilst the municipalities of the remaining towns function under the Dzongkhag administration. The city corporations and the municipalities are responsible for operation and maintenance of urban water supply systems.

Water tariff on actual consumption has been put in place in the urban centres of Thimphu and Phuntsholing since the January 1996. These charges are billed on a monthly basis and assessed on the basis of operation and maintenance costs. Similar arrangements were introduced in 4 other towns, namely: Paro and Samdrup Jongkhar in June 1996, and Gelephu and Trashigang in July 1998. The structure of water tariff prescribes Nu. 1.25/ m3 for residential uses, and in the case of commercial or industrial uses, a differential tariff is applied: Nu. 1.25/m^3 for water consumption up to 20 m^3 , Nu. 1.5/m^3 above 20 m^3 but less than 40 m^3 and Nu. 2.5/ m^3 above 40 m^3 . The above tariff structure is under revision at the moment. The other remaining towns continue to thrive on subsidized water. Residents of Thimphu and Phuntsholing are levied a sanitation tariff calculated at 50% of the water tariff.

4.9 Water Conflicts[19]

The provision of water supply brings immense benefits but at the same time such developments also accompany both anticipated and unanticipated predicaments. There have been a reported number of cases of conflicts arising from water supply programmes between communities as well as within communities. Consumptive water use in the cases of irrigation and drinking water supplies in areas not well endowed by water resources cause communities to conflict over water rights and sharing of water at the sources. Land ownership rights and water infrastructure development entwine generating significant friction as to modes and volumes in compensatory terms. Conflicts as to disposal of wastewater by the upper households affecting those in the lower have also been reported as frequent, besides damages of supply lines either by animals or humans either intentionally or by accident. Besides there are institutional problems such as sedentary village water committees, inefficient use of funds generated affecting general maintenance of water systems and so on.

[19] Source: Rural Water Supply Conflict Study, PHES, Department of Health, March 2002.

4.10 Hygiene Practices

In Bhutan, peoples' perceptions to illness are linked to traditional beliefs and most people will turn first to spiritual and ritual remedies in case of illness. Efforts are made by the health sector to educate the people on the importance of good hygiene to maintain good health. A 1993 KAP study conducted by the Information, Education and Communication for Health (IECH) under the Department of Health revealed a noteworthy trend that traditional healers were no longer viewed as the main source of health information. The study revealed the most common sources of health information for the rural masses to be from the health sector personnel (39%), national radio (35%) and through the village health workers (12%).

The 1993 RWSS impact study[20] revealed that as high as 52% of the sampled population did not know how diarrhea is spread against only 11% responding correctly. Here, as high as 37% had wrong notions on the spread of diarrhea. Of the samples, 50% were observed to wash their hands before meals with water alone, 31% with water and soap, whilst 17% did not wash at all. In terms of storage of water, it was found that 79% of the household water storage containers had covers as a precaution against contamination whilst 9% did not have. Flies constitute a major sanitation problem and besides the quality of family hygiene, the stabling of animals in or near to the houses worsen the situation. The study revealed that 41% of the rural households stable animals in or near house, 37% stable away from house, whilst 22% did not own animals. The types of cooking stoves impact on respiratory and or eye infections. The study assessed that only 21% of rural households maintained smokeless stoves whilst the majority 69% thrived on traditional stoves. At least 10% had switched on to other means of cooking such as gas and electricity.

The 1992 NWAB/SNV study[21] revealed that in villages with piped water systems, 55% of the adults reported to bathe once a week, compared to 11% in villages without piped water. Here, 56% of women reported that they bathed between once a day to once a week and 12% between once a week to once a month. A strong correlation was found to exist between the number of times women bathed and the frequency of washing clothes. Clothes of small children were washed often, if not daily. Children were found to be bathed more frequently with 28% reporting to bathe their small children once or twice a day, whilst 46% bathe their children once to several times a week. Children beyond four or five years of age tend to bathe when their mothers do.

4.11 Overview of External Support to the Water and Sanitation Sectors

Realizing water to be a key element in the socio-economic development process of the country, the third five-year plan (1972-77) saw the gradual emergence of responsible water and sanitation sectors receiving advisory, financial and technological assistance from a number of external agencies.

The rural water supply and sanitation (RWSS) programme began in 1974 with UNICEF cooperation with a view to improving the general quality of life of the people of Bhutan. The UNICEF support to the water supply and sanitation programmes included technical support, financial assistance, non-local supplies and equipment. That year saw the implementation of small and simple gravity-flow supply systems for rural communities and by 1980, a total of 216 such schemes were in place. Two years later, it was estimated that at least 10% of Bhutan's population received the benefits from UNICEF assistance. During that period, Canada, Germany and Australia offered funding support in addition to UNICEF's contribution. In 1982, the Government of Denmark, through DANIDA, agreed to lend support to the RWSS programme until 1988. By 1990, close to 30% of Bhutan's rural population and about 60% of urban

[20] Impact Study of RWSS Programme, UNICEF/RGoB/SNV, 1993
[21] Gender Issues in Water and sanitation – The Case of Bhutan, NWAB/SNV, 1992

population had access to safe drinking water while over 50% of rural and 80% of urban had access to sanitary latrines

Taking a more holistic approach, the European Economic Community started RWSS funding in 1989 in association with UNICEF that was to last until 1994, while the Netherlands Development Organization (SNV) offered significant technical assistance. By then, close to 50% of Bhutan's population had access to safe water supplies with over 1700 schemes implemented, while 70% of the population had access to sanitary latrines. In addition, more than 360 old water schemes were rehabilitated.

Under the EEC /UNICEF funding, a total of more than 4,810 household latrines were constructed, particularly more complicated models of pour-flush type besides the simpler long drop compost and ventilated improved pit. In 1993, the Government withdrew subsidy for latrine construction and made it mandatory for every household to construct its own latrines at own costs. This was largely possible through a Royal Decree issued in 1992, which stressed the importance of having a household latrine and the responsibility to the upkeep, by every household in Bhutan.

Beginning in 1990, activities at improving the environmental hygiene situation of the rural population were given more prominence, realizing that construction of water schemes and sanitation provisions alone did not necessarily affect the health status of the population. The Information, Education and Communication for Health division (IECH) under the Department of Health was assisted by UNICEF in the establishment of Model Villages. Under this funding, health committees of the model villages were supported to take on the development of latrines, separate sheds for cattle, paved footpaths, smokeless stoves or separate kitchens, garbage pits and so forth resulting in a visibly cleaner village environment.

Presently, the Government of Denmark through DANIDA has allocated funds for the rural water supply programmes for a five-year period ending in June 2005. Similar investments by DANIDA are also in place for improvement of urban water supply and sanitation infrastructures besides loan and grant funds from the World Bank and Asian Development Bank.

Since 1999, the UNICEF has gradually moved away from its initial role as a service delivery facilitator, after 25 years of fruitful cooperation in the rural water supply and sanitation sector. Instead, UNICEF converged its assistance to supporting institutional and capacity building activities in the rural water supply programmes while continuing its commitments to building water and sanitation infrastructure in rural institutions such as schools, basic health units and religious institutions. By 2000, the water supply and sanitation coverages in schools reached 60% and 54% respectively. The coverage in monastic institutions in terms of water supply and sanitary latrines reached 24% and 21% respectively. Besides, UNICEF's own resources, the institutional water supply and sanitation received significant supplementary funds from Japan, Australia, Austria and South Korea since 1999. The overall achievement of the water and sanitation sectors as of 2000 is largely accredited to the coordinated efforts of the UNICEF and its bilateral partners and the commitment placed by the Royal Government in reaching these basic human needs to the grass-root levels.

5. STRENGTHS & CRITICAL ASPECTS OF THE SECTOR

5.1 Strengths & Weaknesses

5.1.1 Public Health Engineering Section (PHES)

On the issue of rural water supply and sanitation (RWSS) development programmes, the Royal Government of Bhutan (RGoB) has always accorded high priority as the sector is geared to addressing basic human need. This itself is one of the most significant strength of the sector and the present scenario of achievement is a result of the forward thought and support provided unfalteringly. This trend of RGOB support to the sector will continue with new dimensions incorporated in terms of strategic policy, defined roles and regulations in view of an integrated approach in water resource management.

The following are the outline of some of the critical aspects and challenges faced by the sector in over two decades of RWSS programme implementation:

- The sector has not been able to establish a comprehensive database on the RWSS schemes. This was largely accredited to lack of complete record of data of the older/ initial phases of the programmes, where various organizations and agencies were involved in the execution of the programmes.
- The sector could incorporate technical design manual only in 1993 for standardized construction of the RWSS. Therefore, most of the schemes constructed before 1993 could not satisfactorily meet technical standards due to which the non-functional rate of these schemes were high.
- The sector has not been fully successful in establishing a proper and sustainable management system for the repair and maintenance of the constructed schemes. Until 1990, the management including all repairs and maintenance of the RWS was carried out by the sector without encouraging community involvement. The beneficiaries of such schemes still see ownership and responsibility for the maintenance and rehabilitation as being that of the sector or RGOB due to which many schemes (as high as 30% as per PHES) became non-functional.
- The sector put emphasis on executing more number of schemes until the end of 7FYP and gauged their achievement through the coverage. This however led to neglect of construction quality of the schemes as well as the quality of the water supplied by the scheme. This may have contributed in lowering the expected lifespan of the schemes from 20 years design life to an average of about 12 years in reality as indicated by the survey of 664 rehabilitated schemes.
- The present practice of work implementation of the sector through the district (Dzongkhag) engineering cells seems to be creating conflicts with other priorities of the Dzongkhags hampering in the efficiency and effectiveness of the RWSS works. However, the sector is optimistic that this will improve with the current decentralization policy of the Royal Government wherein the Block development committee (GYT) will lead the role in planning, implementation and management of all future programmes.

5.1.2 Department of Urban Development & Housing (DUDH)

Until the end of 6FYP, the support to the urban sector received low priority due to which the sector was not been able to provide basic urban infrastructure services including water supply and sanitation systems in many of the existing towns. With rapid urbanization particularly in Thimphu and Phuntsholing, the government recognized the need to address emerging urban issues from the 7FYP onwards. The sector since then been strengthened and the external assistance was sought to help in addressing urban issues including water supply, sewerage and other sanitation facilities. Some of the important aspects worth discussing in relation to the strength and weakness of this sector are outlined below:

- The urban centers are administered under the purview of the Municipal Act. The larger towns of Thimphu and Phuentsholing have City Corporations while other towns have municipalities under the chairmanship of the respective Dzongdas (District Administrators). All other municipalities function under the engineering cell of the Dzongkhag (District) Administration.
- Inadequate regulatory framework - the main constraint in the sector to sustainable urban development is the absence of key elements of the requisite policy, legal and regulatory frameworks to control haphazard growth of the urban centers.
- Inadequate data – the sector is yet to develop a reliable information and database system on the demographic statistics and rural – urban migration.
- Insufficient Revenue – the local revenues in most towns are inadequate to operate and maintain infrastructure & services and to finance developmental activities.
- Poor locations of many towns in terms of availability of good and adequate sources of water have put pressure to the sector in providing efficient and cost effective services. The sector has a long way to go to provide safe and adequate supply of water in all the urban centers

5.2 Factors that limit or enhance the effectiveness and efficiency of the sector

Both rural as well as urban water sectors have very similar factors influencing the effectiveness and efficiency of the sectors and some of key factors are outlined below:

Institutional

The question of sustainability arises as is recognized that rural communities and communities in the newly emerged satellite towns lack the skills and proper know-how of project implementation and are unlikely to know the range of operation and maintenance technologies and their associated costs. Standards of workmanship are low and long-term sustainability is hampered because essential materials for the projects come from different sources, making standardization impossible. Most materials excepting cement and HDPE have to be imported and the management of supply and logistics operations is extremely difficult.

Manpower

The country in general is faced with an acute shortage of qualified and experienced local manpower at all levels due to which the sector is often confronted with weak implementation and maintenance capacities. Responsibilities have increased on the limited technical capabilities of PHES, DUDH and the Dzongkhags owing to a growing number of programmes spread throughout the country.

Financial

Bhutan has used a mix of local revenue, external aid and international loans to finance its development. Bhutan is still dependent on external aid for almost all of its development projects. This is a vital factor for making all plans and programmes successful as without a confirmed financing source, no programme however efficiently planned can be realized. The financial resource constraint becomes evident from the fact that allocated budget for a particular programme will usually not match the actual expenditure.

Regulatory Framework

The absence of an adequate regulatory framework has affected sustainable development and equitable utilization of available resources. Requisite policies, legal and regulatory frameworks are needed to contain haphazard growth of systems, resolve inter- as well as intra-community conflicts in terms of water rights and water use and improve inter-agency collaborative efforts at planning and implementation stages.

6. PLANS & STRATEGIES FOR THE DEVELOPMENT OF THE SECTOR

6.1 Plans and National Strategies for the Development of the Sector

6.1.1 Public Health Engineering Section (PHES)

The draft sector policy highlighted in the preceding section indicated the positive support of the government in the development of rational approaches addressing the issues of sustainability, basic service level, and disparities in access and coverage. Some of the important plans and national strategies in the development of the sector are:

- Institutional framework – activities of the water and sanitation sector will be routed through the focal organization, PHES, for improving coordination between different programme executing bodies in the Dzongkhags and to provide better programme monitoring, management information and reporting system. PHES is to identify and test possible new technologies for better services in the sector. PHES will be responsible to preparation and enforcement of the required norms and standards for quality control and supervision of the sector programmes. PHES will also be responsible for development of a proper central database system of the sectors' activities and the programmes. Further, PHES will develop financing mechanism guidelines to make the programme sustainable in a long run.
- Decentralized planning and implementation – The sector will follow demand responsive approach and the DYT, GYT and the communities will be involved in the decision making process. With the past experience of the sector, the programmes implemented with community participations showed higher success and sustainability rate. Therefore, the sector will maintain this path and involve the beneficiaries from selection of the programmes to implementation and management.
- Private sector participation – With the increase in the volume of works and responsibilities, the sector has foreseen the requirement to involve private sector services for effective implementation of the RWSS programmes. The sector foresees that with the involvement of the private sector, quality, and accountability of programme implementations could be improved.
- Implementation strategy and scheme selection criteria – specific scheme selection criteria will be developed by the sector for prioritizing selection of schemes. Emphasis will also be given to implement the more sustainable schemes after proper survey and design giving adequate importance to quality of construction and water supply quality. With this practice, it is envisaged that the schemes will serve the expected design lifespan of 20 years.
- HRD and training – Future development of the sector as envisaged in the policy will require an intensive HRD and training effort focusing on supporting community management organizations, decentralization of planning, design and procurement and improved monitoring and skills development at all levels. To realize this aspect, the PHES's training functions and staff will be expanded to enable it to plan, implement and monitor the new and expanded training requirements in the sector.

6.1.2 Department of Urban Development & Housing (DUDH)

The strategic approach of the sector policy is to promote planned and effective urban management so that the urban centers become livable and in harmony with nature and culture. Some of the important plans and strategies for the development of the sector are:

- Institutional framework and implementation strategy – all urban development and management activities nation-wide will be routed through DUDH that will formulate

policy, rules and regulations of the sector. Thus DUDH will also be responsible to survey, planning, design, quality control, monitoring, review & evaluation and reporting of the sector programmes. The respective Dzongkhags and their municipal corporations will carry out implementation and post-construction management aspects.

- Strategy for sustainability of infrastructure services – the sector is to develop proper guidelines for providing adequate and safe water supply and sanitation facilities on a sustainable basis to all the urban centers through effective and efficient services.
- HRD and training – External funded programmes will promote and provide requisite training of local personnel at all levels for implementation and management of the urban water supply and sanitation facilities.

6.2 Current Projects of the Sector

The development of infrastructure and capacity building remains a high priority for the government in its endeavour to improve quality of services in order to improve the quality of life of the Bhutanese people. The current programmes under PHES and DUDH continue to receive the much-needed impetus from external funding besides the Royal Government's limited planned outlays.

6.2.1 PHES

- Water, Sanitation and Hygiene Promotion Project: - This promotion project by UNICEF supports both PHES and the Department of Education. The UNICEF is actively involved in implementing a variety of activities in the encouragement of children to become agents of change to reach rural communities. Besides supporting institutional and capacity building activities at the national, district and local levels, this project includes direct support to rural schools, monastic institutions and a few basic health units. The objectives of the project are to deliver safe and well maintained water supply to 75% of schools and to increase sanitary facilities to 70% by 2006.
- Rural Water Supply Programmes: - DANIDA is presently the active bilateral agency involved in funding RWSS programmes of the sector. Since 2000, DANIDA has committed to fund construction of 494 new RWSS schemes and rehabilitation of 200 old schemes. The commitment is till end of June 2005.

6.2.2 DUDH

Three major external agencies are active in the urban sector in the areas of institutional development and provision of infrastructure services. The important projects of the sector that are being carried in the country are:

- DANIDA assisted Urban Sector Programme Support (USPS) Project – the USPS was initiated in 1999. The focus of the programme is on the institutional strengthening at the central, district and technical-vocational institutions and provision of infrastructure services. The programmes covers Thimphu, Phuentsholing and the district town of Mongar that was selected as a pilot town.
- World Bank assisted Urban Development Project (UDP) – UDP started from May 2000, and will end on June 2005. The project covers 10 selected urban towns: Trongsa, Zhemgang, Lhuentse, Trashiyangtse, Rangjung, Wangduc, Bumthang, Tingtibi and Duksum. Infrastructures in this sector through this project will be provided on a need basis, which will include water supply, sanitation, drainage and solid waste management.
- ADB assisted Urban Infrastructure Improvement Project (UIIP) – The UIIP started from March 1999 and will end on April 2004. The project areas are Thimphu and Phuentsholing. The main aim of the project is to strengthen the institutional capacity and improve urban environment through effective and sustainable management of urban services.

- Plans to address competing uses of water – It has been foreseen that water uses could conflict in future between various uses such as domestic consumption, agriculture, industrial, power generation, environmental, etc. Presently a "Water Act for the Kingdom" with regulations, water right, conflict resolution procedures and legal aspects is being prepared by BWP .

6.3 Bhutan Water Partnership (BWP)

Before the creation of BWP in August 2001, existing water user institutions exhibited independent functional linkages at policy, planning and implementation levels with different users performing their own responsibilities in their own realms. This has been the cause of fragmented data, duplication of efforts and indigent resource management systems devoid of the synergy of integration.

The BWP now is the co-ordinating agency at the national level for integrated water resources management and consists of members from all water user institutions, notably from the Ministry of Agriculture, the Department of Power, DUDH, PHES and the Department of Industry. The body is responsible to the government on issues of water resources protection, development and management. Under the auspices of the BWP, water management will be broad-based with the involvement of all institutions in the water sector through a consultative process. This is envisaged to promote better coordination and linkage mechanisms among the agencies although each will carry on with their respective functional responsibilities.

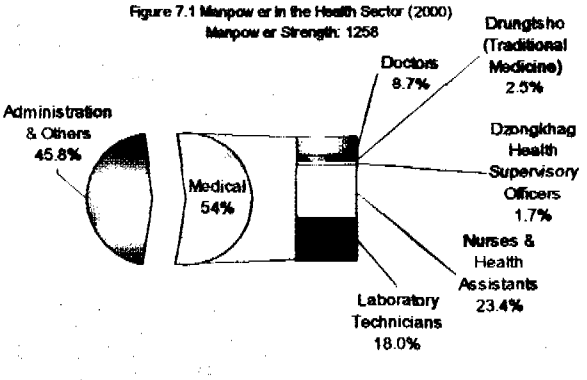
Some of the mandates of the BWP are setting of standards and guidelines, formulation of a sound water policy and development of required legislation. It has been foreseen that water uses could conflict in future between various uses such as domestic consumption, agriculture, industrial, power generation, environment, etc. Presently a "Water Act for the Kingdom" with regulations, water right, conflict resolution procedures and legal aspects is being prepared by BWP.

7. RELATION OF WATER & SANITATION SERVICES WITH HEALTH, ENVIRONMENT, SOCIAL AND ECONOMIC DEVELOPMENT

7.1 An Analysis of Current Situation, Effectiveness & Causes

The gradual evolution of the country since initiating its first formal plan of development in 1961 has exposed the nation from a sphere of self-imposed isolation to the forces of change and modernization. The remote and scattered settlements of a small population that are mainly subsistence farmers living in an extremely mountainous geography with arduous communication links make the delivery of development activities time-consuming and costly. Since the very beginning, all development plans have always put in the forefront the delivery of health and education services to the masses at a level with agriculture development and road infrastructure building.

The overall current situation of the country, although very low by international standards, bears testimony to the fact all its development trials and tribulations were grappled with resource and physical constraints. Nevertheless, the progress achieved in the delivery of health services to the population can be regarded as appreciable but that should not leave any room for complacency. There are critical areas such as the provision of adequate, improved and expanded nation-wide primary health care network and the expansion of maternal and child health services, bringing such services closer to those that need the most. The current estimation is that 89% of the rural population are within three hours walk from the nearest health service centre. The expansion of such services should match with available manpower, but even today there is an acute shortage of trained manpower that can professionally provide promotive, preventive and curative health services. (Figure 7.1) Also new challenges arise with the emergence of communicable and non-communicable diseases as result of changes brought about by development.

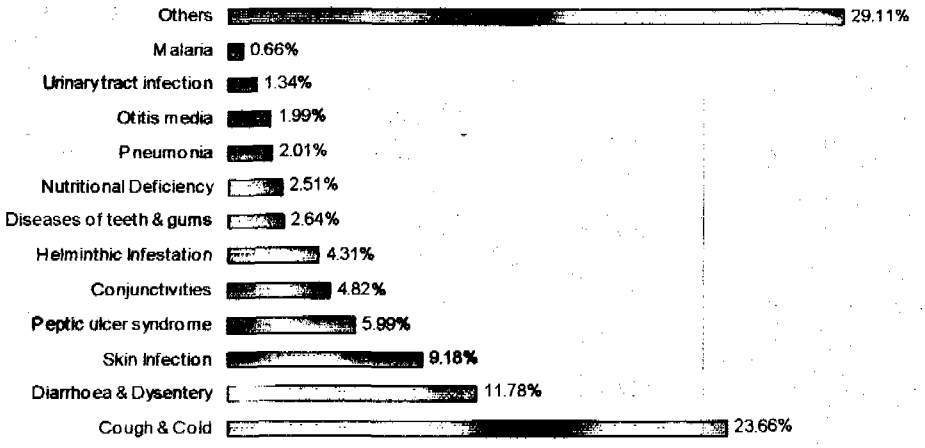


The number of medical staff excluding traditional medicine (Dungtsho) practitioner and district health supervisory officers per 100,000 population for the year 2000 is estimated below: All figures are very low by international standards.

Numbers per 100,000 population (Y2000)	
Doctors	15.6
Nurses & health assistants	42.1
Laboratory Technicians	32.3

While infant mortality and maternal mortality rates have declined substantially during the decade, they are still considered high. Among the leading causes of mortality under 5 years, the most notable is respiratory infection, followed by diarrhoea and dysentery, skin and eye infections, parasitic infections and others. These diseases are related to unhygienic conditions particularly in the rural areas and the role of safe drinking water supply and sanitation programmes have a direct link to the improvement in these areas of concern. The 2000 morbidity cases for all ages as reported by the basic health units in around the country are illustrated in Figure 7.2.

Figure 7.2 Morbidity Cases Reported by BHUs -2000
(Total 569,489 cases)



7.2 Impact of Rural Drinking Water & Sanitation on Health & the Environment

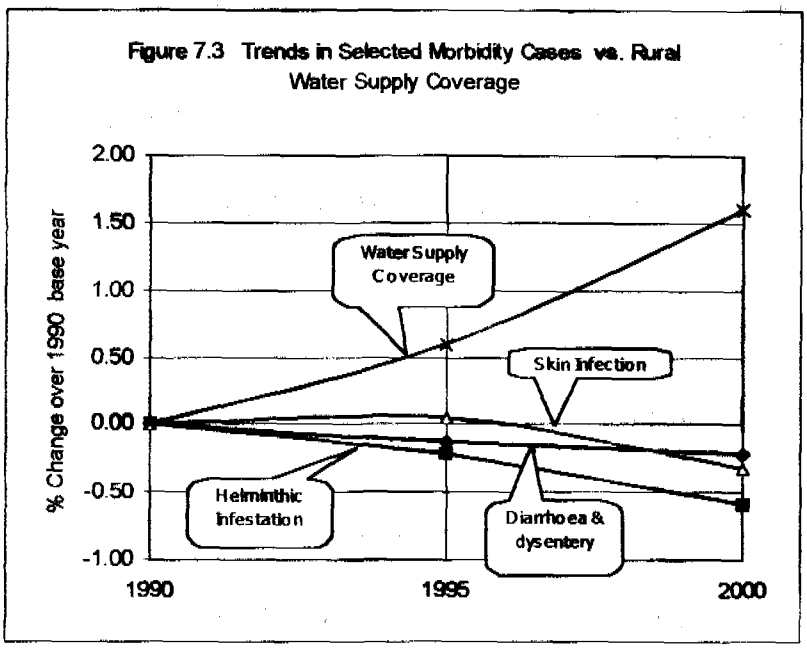
The relationship between improvement in water supply and sanitation and a decrease in water and sanitation related diseases is complimentary in nature but can be very complex as a host of factors also impact the nature of relationship. It must be cautioned that the information from the BHUs may not be sufficiently representative of the rural populations for the main reason that all rural folks may not report to the BHUs to avail the facilities of modern medicine for reasons best known to them. Nevertheless, the information from the basic health units being the only source of information on rural morbidity is taken for granted. The data on common water and sanitation related morbidity cases are extracted from the health bulletins and summarized in Table 7.1 below.

Table 7.1 **Common Morbidity Cases - BHUs**

Water & Sanitation Related Morbidity Cases	[illegible]	[illegible]	[illegible]
		Under 5 years	
Diarrhoea & Dysentery	24.00%	22.50%	22.40%
Helminthic Infestation	10.90%	9.20%	5.70%
Skin Infection	15.90%	17.20%	11.60%
		All ages	
Diarrhoea & Dysentery	15.10%	13.27%	11.78%
Helminthic Infestation	10.60%	8.32%	4.31%
Skin Infection	13.40%	13.97%	9.18%

Sources: Annual Health Bulletins, 1990, 1995 & 2000.

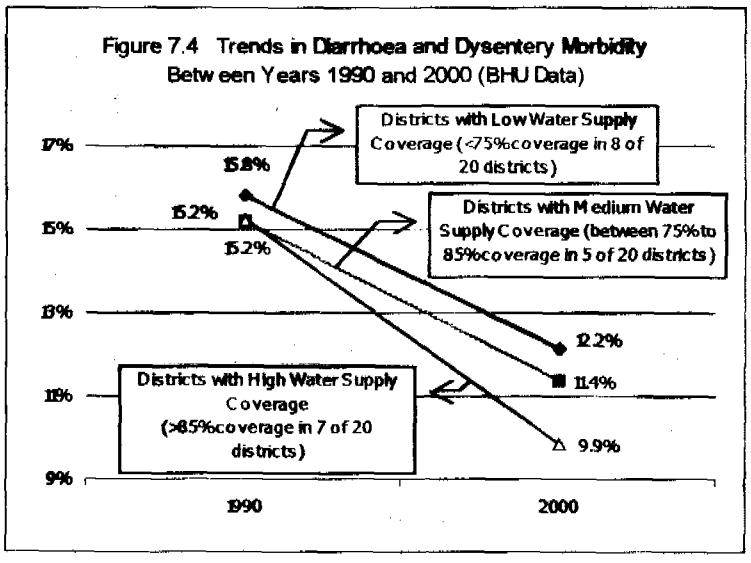
The proportions given above are based on the total number of patients who benefited from the facilities of all BHUs during those particular years. An observation of the data shows gradual decreasing trend in those morbidity cases listed. The percentage changes in the morbidity cases of 1995 and 2000 for all ages are worked out by taking 1990 morbidity data as the base year and contrasted against a projection for rural water supply coverage using the estimated coverage figures of Figure 4.1.



The changes in the morbidity cases of diarrhoea & dysentery, skin infections and helminthic infestations indicate negative growth, meaning that these cases as a proportion of all reported cased is on the decline whilst on the other hand the coverage by rural water supplies has increased tremendously during the decade. Without delving into the complexities of the relationships, one can by observation of the trends in Figure 7.3 say that there is a positive impact on the general well-being of the rural population due to the improved drinking water supply programmes.

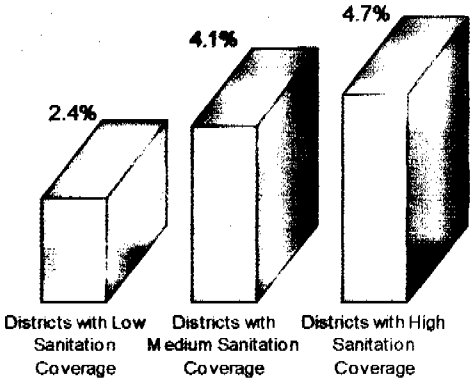
The 20 districts of the country have been classified tentatively into low, medium and high water supply coverage areas based on the 2000 data. The tentative classification has been shown in Table 4.1. For the districts within each water supply coverage class, their diarrhoea and dysentery occurrences are averaged to look for contrast between the years 1990 and 2000.

The trend in proportion of diarrhoea and dysentery morbidity for all ages as reported by the BHUs in the years 1990 and 2000 are compared in relation to the water supply coverage classifications and is shown Figure 7.4. Diarrhoea and dysentery morbidity has fallen during the decade for all three classes but then there are noticeable differences in the rate of decreases. The rate of decrease in diarrhoea and dysentery morbidity observably holds direct relationship to the water supply coverage such that the class with high water supply coverage has lesser incidence of this morbidity and vice versa.



A similar procedure separates the districts in terms of year 2000 sanitation percentage coverage into high, medium and low coverage, and their mean diarrhoea and dysentery morbidity is calculated for the years 1990 and 2000. A plot of percentage drop between 1990 and 2000 diarrhoea and dysentery morbidity is shown in Figure 7.5. The decrease is high where the sanitation coverage is high and vice versa.

Figure 7.5 Drop in Diarrhoea and Dysentery Morbidity Between 1990 and 2000 in Relation to 2000 Rural Sanitation Coverage



The improvement of local environment in terms of proper management of both human and animal excreta and the overall awareness of general hygiene as echoed by villagers in Rinchengang in Wangdue district is reproduced in box 7.1 below.

Box 7.1

A village overcomes disease to become a model of health

Contributed by Ms. Payden, PHES, Thimphu.

In just five years, this remote village, Rinchengang under Wangdue District, has been transformed into a picture of health. Those that live to remember the old times will tell you that there was no safe drinking water supply in the seventies and no proper sanitation either. Man and animal lived in close proximity - indeed, animals were kept in the ground-floor of the village homes, amid a litter of animal dung and other household waste. The community drew its water from a small spring and it took an average family about one hour to fetch five litres of water. The members of the community spent most of their time in fetching water for their household needs.

Although there is no date, an elderly woman of the village recalls that illnesses like diarrhoea, scabies, and worm-infections were commonplace, as were deaths due to them. In fact, of the 13 children she gave birth to, only four survived beyond five years of age. The village headman also remembers that 10 out of every 15 children would die due to diarrhoea and other diseases. Mr. Dorji, water committee member, now 40, also relates that, when he was young, the situation was appalling.

In 1992, a Royal Decree was issued urging that every household have access to safe drinking water and sanitary latrine. The health staff organized meetings among the village representatives on health and hygiene issues. The villagers came to realize that water-related diseases could be prevented and many lives saved. The community of 900 population decided it was time to improve the quality of their lives.

7.3 Functions of Health / Hygiene Promotion & Demand Generation

The Information, Education and Communication for Health (IECH) division under the Department of Health has a specific task of bringing specific health and hygiene information closer to the rural masses. In conjunction with the health personnel in the basic health units, regular campaigns on safe drinking water, environmental sanitation, nutrition, hygienic practices, and communicable and preventable diseases are carried out. Communication materials such as posters, booklets, and printed modules on both paper and cloth are prepared and distributed to all hospitals, basic health units and outreach clinics by IECH.

Outreach clinics and basic health units are indispensable infrastructure built to cater to the health needs at the grass-root level. However, owing to shortage of manpower in the basic health units, village health workers (VHWs) are appointed from among rural communities to assist health

personnel in disseminating knowledge on health matters. The VHWs are provided training in elementary health and hygiene, and carry out functions of advocating hygiene and sanitation, family planning, immunization, nutrition and even treat and dispense medicines for minor ailments. They act as a crucial link between health personnel and the communities, passing on information on MCH clinics and home visits.

Since 1993, the IECH with the support of the UNICEF started to intensify the promotion of sanitation by health personnel based in rural areas, aiming to make the rural health staff more effective at promoting sanitation as part of their routine assignments. The basic health units continually receive assistance for specific sanitation promotion activities. Further, health and hygiene issues are included prominently in the curriculum of the "Non-Formal Education" programmes conducted by the Department of Education.

The health and hygiene promotion has exploited the potentials of religious practitioners such as monks, nuns and others, in prompting rural people on the important aspects of health and sanitation whilst sustaining their spiritual needs. The creation of communication dispelling age-old beliefs and misconceptions through clarifications by the religious order is being successfully launched in areas such as family planning, nutrition and clinical attendance.

The promotion of health and sanitation by basic health staff at the grass-root levels was found to be well received by the rural folks and since 1994, the concept of 'model villages' was transformed into reality with over 200 villages initiated into this programme. In the model village programme, each household not only built its own latrine but also used it consistently, and adopted the practice of washing hands with soap after using latrine and before meals. The households also established kitchen gardens to utilize wastewater, established compost pit for household refuse and garbage, shifted animal sheds away from the house and purchased and installed smokeless stoves. A comprehensive environmental improvement was achieved side by side with the improvement of hygienic practices.

The positive aspect of the concept of model village that was established on a demonstrative basis is now reportedly being adopted by other villages. Literally, the demand for improved health and hygiene improvement is being understood as an integral requirement apart from spiritual and moral values by many of the rural population.

7.4 Prospects of Health & Environment with the Water & Sanitation Sector and Equity of Services

No single type of intervention has greater overall impact on national development and public health than the provision of safe drinking water and education in proper sanitation practices. The ninth five-year plan (2002-2007) visualizes accessibility of drinking water to reach full coverage by the end of the plan period. The tasks of bringing such interventions are by no means an easy one given the kind of situation the country is in. Technology, human behaviour, institutional and financial support are essentials for obtaining the benefits. The actual construction of facilities is not enough for achieving health benefits, rather water and sanitation systems must reduce the risk of infections, and people must use the system properly and maintain it.

The sustainability of the water and sanitation systems are possible when beneficiary involvement in planning, construction and management are sound. Meaningful participation requires devolution of power and prioritization of needs and this rendering is yet a challenge with the Geog-based decentralization to be in effect from July 2002 onwards. The decentralization exercise will however need an integrated support of the PHES and the Dzongkhags in achieving the intended goals in health and environment. Prospective areas in which the Department of Health, PHES and the Dzongkhags can intervene interactively for improvements in health and

environment lie in fostering community participation, strengthening organizational skills of the communities, and intensifying health and sanitation education.

The water and sanitation sector in the urban setting face greater challenges. There are the growing issues as a result of rural to urban migration. The limited housing infrastructure is over stretched by the rapid urban growth and in turn has been adversely affecting the water supply and sanitation situations. It has been estimated that over 1,500 dwelling units are required to be constructed over the next ten years if the problem of housing is to be mitigated. Failing to meet such a demand will result in the creation of squatter units and its associated water and sanitation problems. Today, urban development is a daunting task posed by factors such as an inadequate regulatory framework, insufficient resources, weak private sector and non-availability of land for development.

7.5 Economic Value of the Sector

There is no doubt that bringing safe drinking water closer to the homes of the people has eased tremendous pressure on women and children that bear the brunt of the labour in fetching water for domestic consumption. By offsetting the time spent in the monotonous routines of fetching water, indescribable benefits are obvious as economic and social functions are directly enhanced.

The Bhutanese economy is primarily agricultural which is pursued by 79% of the population. Its share (agriculture proper) of the GDP in 2000 was 17.9% or approximately US$ 250 per capita per day. The rural water supply programme today covers approximately 78% of the rural population, and that is 62% of the total population. If suppose, an average rural family gains an hour of fruitful work per day due to the fact that drinking water is available at their doorstep, then a very rough estimation of the contribution to the GDP by the RWSS programme works out to be about US$ 6 per capita per day. This, at current prices is Nu. 290 per capita per day.

It is widely acknowledged that improvements in national health are a cause as well as a consequence of overall development. Improvements in the general standard of health and hygiene as a consequence of improved water use and sanitary practices can be translated to improved physical well-being indicative of a healthier and thus more productive society. Significant contributions to the national economy are apparent through reduced burden of water and sanitation related diseases. Education of the children, particularly that of girls, is enhanced and gender-based disparities narrowed through the RWSS programmes by offsetting the opportunity costs linked to fetching of water.

The country has a very low level of industrial activity. The factors that affect the low development of industries in the country are a weak entrepreneurial orientation, high transport costs, small domestic market, an under-developed infrastructure and lack of a resource inventory. In response to the needs of the water and sanitation sectors, a medium-scale polythene pipes and fittings manufacturing unit was set up in mid 1980s. The contribution of this manufacturing unit to the national economy and its values is difficult to estimate but about 80% of the country's total requirement of polythene pipes is met through this industry.

In terms of overall employment, the water and sanitation sectors acquiesce promising returns. Emphasis is made in the learning of basic skills in house-wiring, plumbing, carpentry and masonry through the initiatives undertaken by National Technical Training Authority (NTTA) utilizing the facilities available with its two technical schools. Training in these fields have been conducted over the decade and continue even today to the benefit of the employment market. A significant number of plumbers, electricians, carpenters and masons have found gainful employment through the water and sanitation initiatives.

8. FUTURE PROSPECTS

8.1 Future Investment Needs

8.1.1 PHES

The objective of the sector assumes to achieve total coverage of all rural population by the end of 2007. Thus the present day planning of the PHES broadly classifies their activities in terms of construction of new water supply schemes, works on spring protection and rehabilitation of older schemes. The estimates[22] of works based on an annual population growth rate of 2% for the five-year period indicates that for full coverage, the total number of new schemes is around 700 as shown in Table 8.1. Besides it projects that during every year around 40 old schemes would be rehabilitated but then a backlog of rehabilitation would rise to some 810 old schemes by the end of the plan period.

Table 8.1 Estimate of RWSS Plan of Works - 9FYP

Year	Construction of New Schemes		Total RWSS Schemes by end of year	Rehabilitation of Old Schemes		
	Annual Construction rate	Total Constructed		Annual Rehabilitation rate	Annual Rehabilitation Need	Backlog of rehabilitation
2002	130	130	2480	40	150	260
2003	130	260	2610	40	150	370
2004	130	390	2740	40	150	480
2005	130	520	2870	40	150	590
2006	130	650	3000	40	150	700
2007	50	700	3050	40	150	810

The financing of the water supply programmes is divided into three categories viz., the community contribution amounting to about 25% of the total cost of construction, the government contribution amounting to about 15% of the cost of construction and the remaining 60% through external funding. The community contribution consists of provision of local materials, transportation of materials from the nearest road-head and labour. The government contribution is allocated in the form of provision of skilled labour and transportation of materials from RWSS store in Phuntsholing to the Dzongkhag stores and thence to the nearest road-head. Materials not available locally are purchased and transported till the central store through donor funds.

The investment in the RWSS programmes is based on the cost of non-local materials as funds will have to be secured either through donor assistance or be met by the government. Fortunately for the country, the Government of Denmark (DANIDA) has allocated funds for RWSS programme for a 5-year period ending in June 2005. The total support by DANIDA represents 32% of the total required investment (at 2001 prices) in the rural water supply sector during the ninth five-year plan period. A deficit in the investment budget to the tune of Nu. 79 million is projected by mid 2005 as the committed donor fund will be fully consumed by then.

An overview of the average investments needed annually in the RWSS, the confirmed source of funding and the projected shortfall in investment is given in Table 8.2 below. The estimates are based on PHES's present experience of implementation capacity and a simple straight-forward scenario as targeted in Table 8.1

[22] Source: Rural Water Supply and Sanitation Sector Policy, Background Information Document, June 2001

Table 8.2 Overview of Investment in Rural Water Supply Programmes (9FYP)

Type of Scheme	Average Annual Investment Nu.			Confirmed Donor Support 'DANIDA' - 2001 - 2005 (Nu.)		
	Cost per scheme	No. of schemes	Total Cost	Investment per scheme	No. of committed schemes	Total Donor Investment
New	113,486	130	14,753,180	122,000	494	60,268,000
Rehab.	109,875	40	4,395,000	122,000	200	24,400,000
Spring Protection	8,649	200	1,729,800	12,200	440	5,368,000
Total			20,877,980			90,036,000
Total Investment (2002 - 2007)	Nu. 125 million					
DANIDA committed 2000-2005	Nu. 90 million					
Deficit by beginning of 2005[23]	Nu. 79 million					

The PHES along with the Department of Education is also responsible for the implementation of the water, sanitation and hygiene promotion project supported by UNICEF. This institutional water and sanitation promotion project is a direct support to rural schools, monastic institutions and a few basic health units. Table 8.3 shows the investment needs and the gaps in relation to the committed funds from 2002 to 2006.

Table 8.3 Overview of Investments in Institutional Water and Sanitation Programme (9FYP)

PHES Activities (9 FYP; 2002-2007)		Investment Projected (x thousand US$)	
1.	Service Delivery	4,786.00	
2.	Capacity Building	812.00	
3.	Programme Development & Project Support	156.00	
4.	Advocacy, Equipment, Software, misc.	513.00	Total: 6,267.00
Committed Funds : UNICEF + Other Resources[24]		(x 1000 US$)	
1.	School-based Water, Sanitation & Hygiene Promotion	1,772.00	
2.	WATSAN support to religious Institutions	199.00	Total: 1,971.00
Financing Gap			Total: 4,296.00 (Approx. Nu. 206 million)

With RGoB financing only the recurrent costs of the sector, the total deficit capital financing in the implementation of the PHES programmes for the ninth five-year plan remains to the tune of Nu. 285 million.

8.1.2 DUDH

The water supply and sanitation development themes are in conjunction with general urban infrastructure development needs submitted by various districts in the country. Table 8.4 briefly summarizes the investment needs in the urban infrastructure development including activities in water supply and sanitation.

[23] Scenario 2 as presented by PHES on their 9FYP programme; Sec. 4.2, Future Funding Requirement, Background Information Document, June 2001

[24] "provided that UNICEF can attract supplementary funding"; Source: Master Plan of Operations 2002-2006, UNICEF Programme of Cooperation for Children and Women of Bhutan

Table 8.4 Investments in the Urban Sector including Water Supply & Sanitation

Sources of Funding	Programme	Estimated Investment Nu.
DANIDA	Urban Sector Programme Support • Period: January 1999 - January 2004 • Institutional strengthening at central, district and technical vocational institutions • Urban planning, administrative & financial management, infrastructure design & implementation, formulation of policies, legislation and regulatory framework • Provision of infrastructure services • Water supply, sanitation, sewerage, solid waste management & pilot housing for 3 towns of Thimphu, Phuntsholing & Mongar (pilot town)	Nu. 229,830,000 (committed)
World Bank	Urban Development Project • Period: May 2000 - June 2005 • Project to cover 10 towns • Strengthen financial & institutional capacity • Urban planning, land use management & mapping, investment planning & implementation, project management, monitoring & evaluation • Support need-based project 'water supply, sanitation, drainage, solid waste management, roads, footpaths and pavements, river protection'	Nu. 397,125,000 (committed) (US$ 12.23 million of which US$ 10.8 million is loan)
ADB	Urban Infrastructure Improvement Project • Period: March 1999 - April 2004 • Project area: Thimphu & Phuntsholing • Infrastructure rehabilitation & improvements	Nu. 39,000,000 (committed) (US$ 8.2 million of which US$ 5.7 million is loan
Government	Development of Other Urban Centres (not covered by above) • Period: 2002 - 2007 • Planned budget for capital investments	Nu. 3,748 million

8.2 Institutional Reforms and Modernization

The emphasis given in the development of water and sanitation sectors is indicative of commitment provided by the government in improving the quality of peoples' health and hygiene. Although much progress has been made in developing the water and sanitation sectors, it is still in its beginning. The process of development in the country has been very dynamic and contemplated structural changes have taken place gradually. Every preceding development plan has been a constructive lesson for the next plan in spite of multitudinous formidable coercion lying in the way of development. Reforms in institutional structure, policies, and legislation have been realized as inevitable in the process of modernization. Positive evidence lies in the fact that from the ninth five-year plan period onwards, the decentralization policy strongly emphasizes the established governance at the grass-root levels to take development issues in their own hands.

The 80th session of the National Assembly (June 25 to July 29, 2002) ratified the *Geog Yargye Tsogchung* (GYT or Block Development Committee) statute that grants unprecedented regulatory, administrative and financial powers to the GYT. The GYT will now identify and formulate development activities with technical backstopping and advisory services provided by the districts. This decentralization exercise is seen as a means of supporting and ensuring balanced and equitable development but the implementation and realization of the policies of decentralization is a massive task.

The role of the newly established Bhutan Water Partnership (BWP) as the coordinating agency at the national level for integrated water resources management faces a daunting task of bringing about a synergistic change in dealing with water use issues. Water policy and the associated

legislation, standards and guidelines, monitoring and evaluation procedures, data assimilation and distribution, and research and development programmes are urgent tasks that BWP must to develop today in order that the water user agencies can adopt in course of their functional duties.

8.3 Conclusion

Considerable strides have been made by way of bringing of water supply and sanitation to Bhutan's population during the past two and half decades, yet much remains to be done in terms of disease transmission and prevention. Children and women still face many risks to their health as even today the severity and incidence of diarrhoea and dysentery morbidity stands alarmingly high. More focus is necessary on the aspects of hygiene. Questions as to how sanitary the latrine facilities are, need more emphasis in tackling the effectiveness of the interventions made thus far.

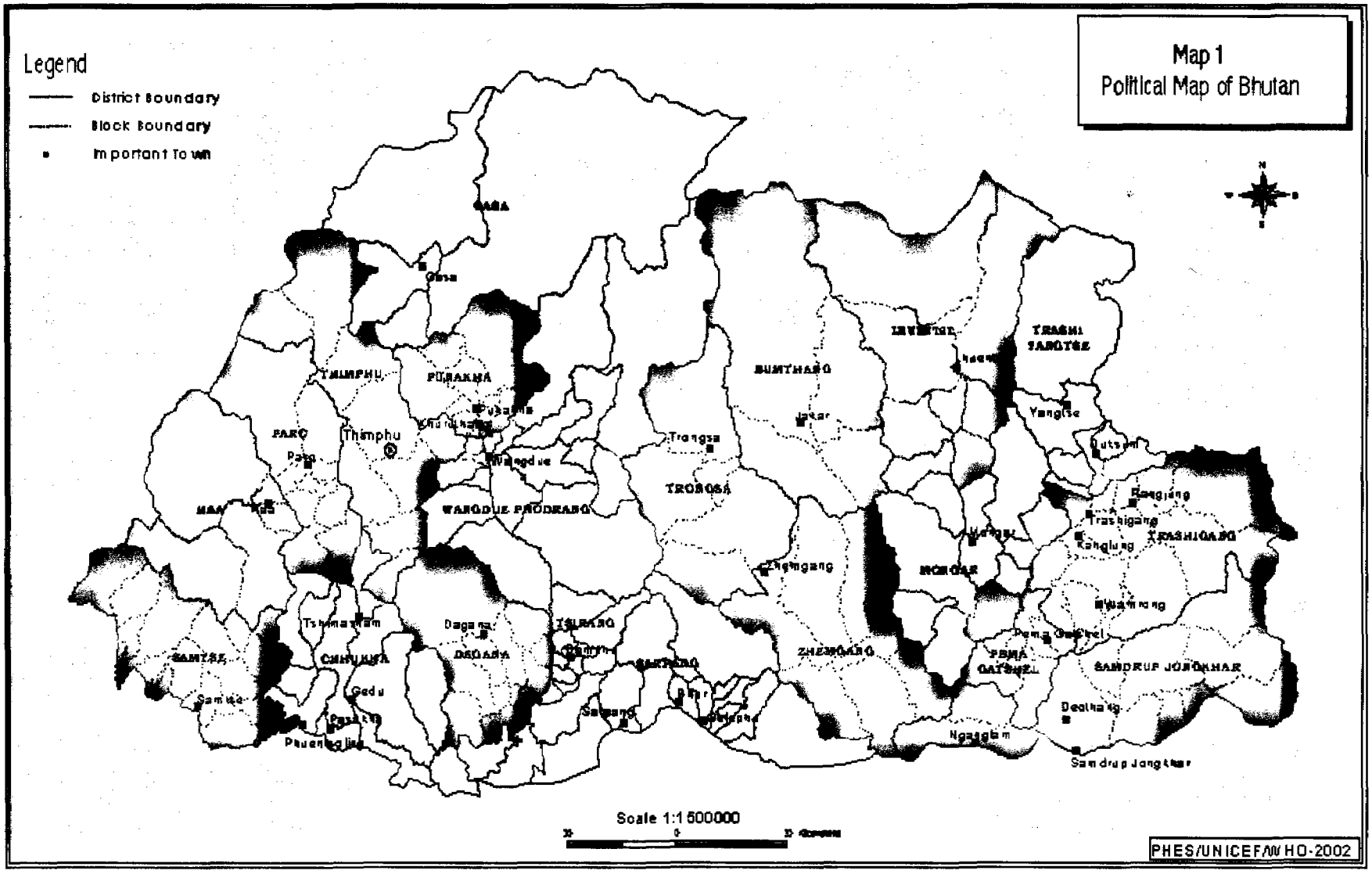
Fresh studies, either KAPB or situational analyses, on hygiene practices by rural households are seen as necessary to update existing literature that date as far back as 1993. Relevant and sustainable mitigatory ways and means can thus be developed through proper understanding of the sanitary situation. The existing communication of motivation and education developed by IECH aimed at improving hygiene around the household through behavioral changes will have to be prolonged for some time to come.

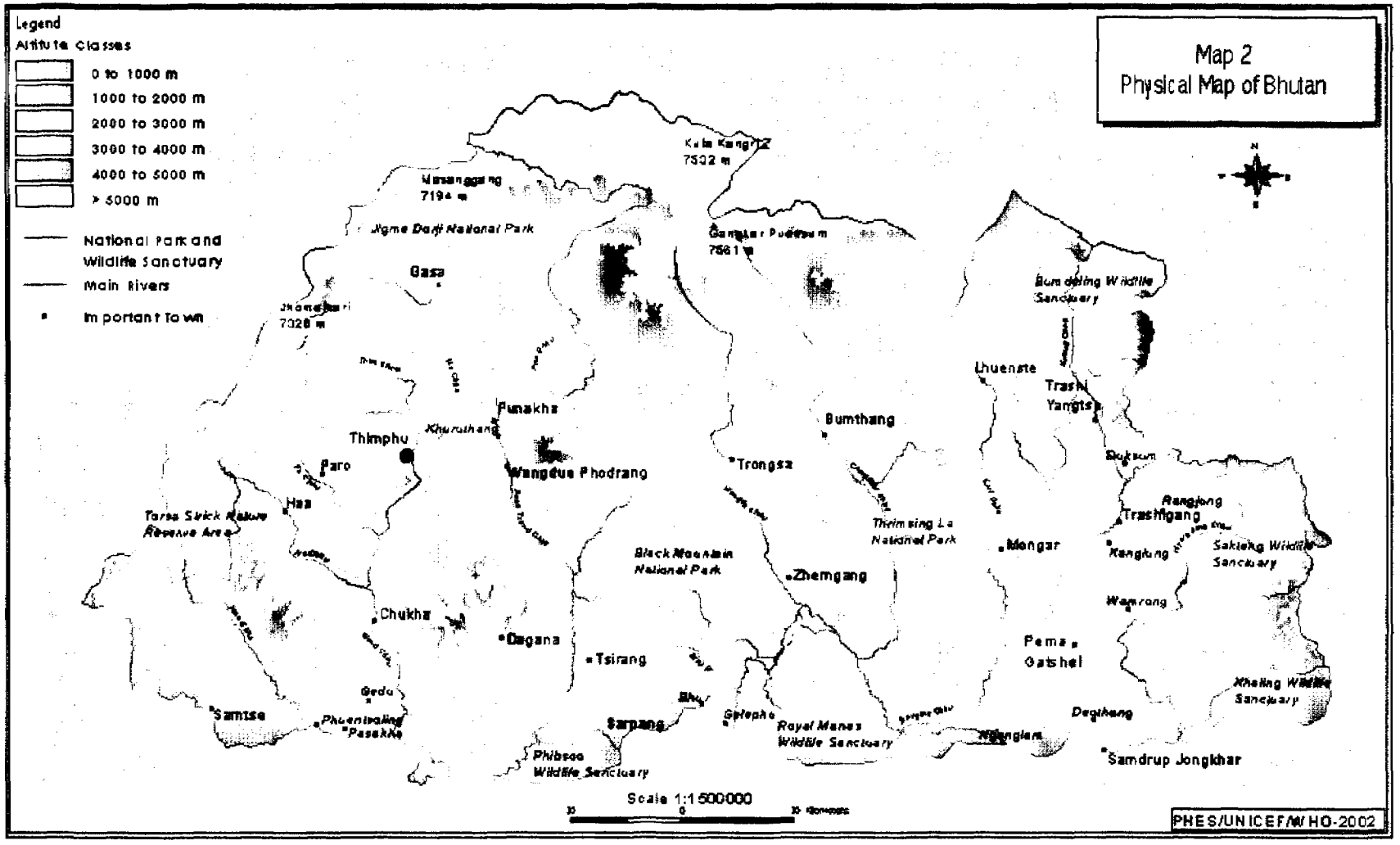
A system of drinking water quality surveillance is under development by the PHES. To accomplish this, capacity building in terms of staffing and equipping the hospitals and basic health units with water testing facilities must be accorded priority. At the village levels, the village health workers or the village water caretakers need be trained in the proper procedures of collecting water samples and the delivery to the nearest laboratory facilities.

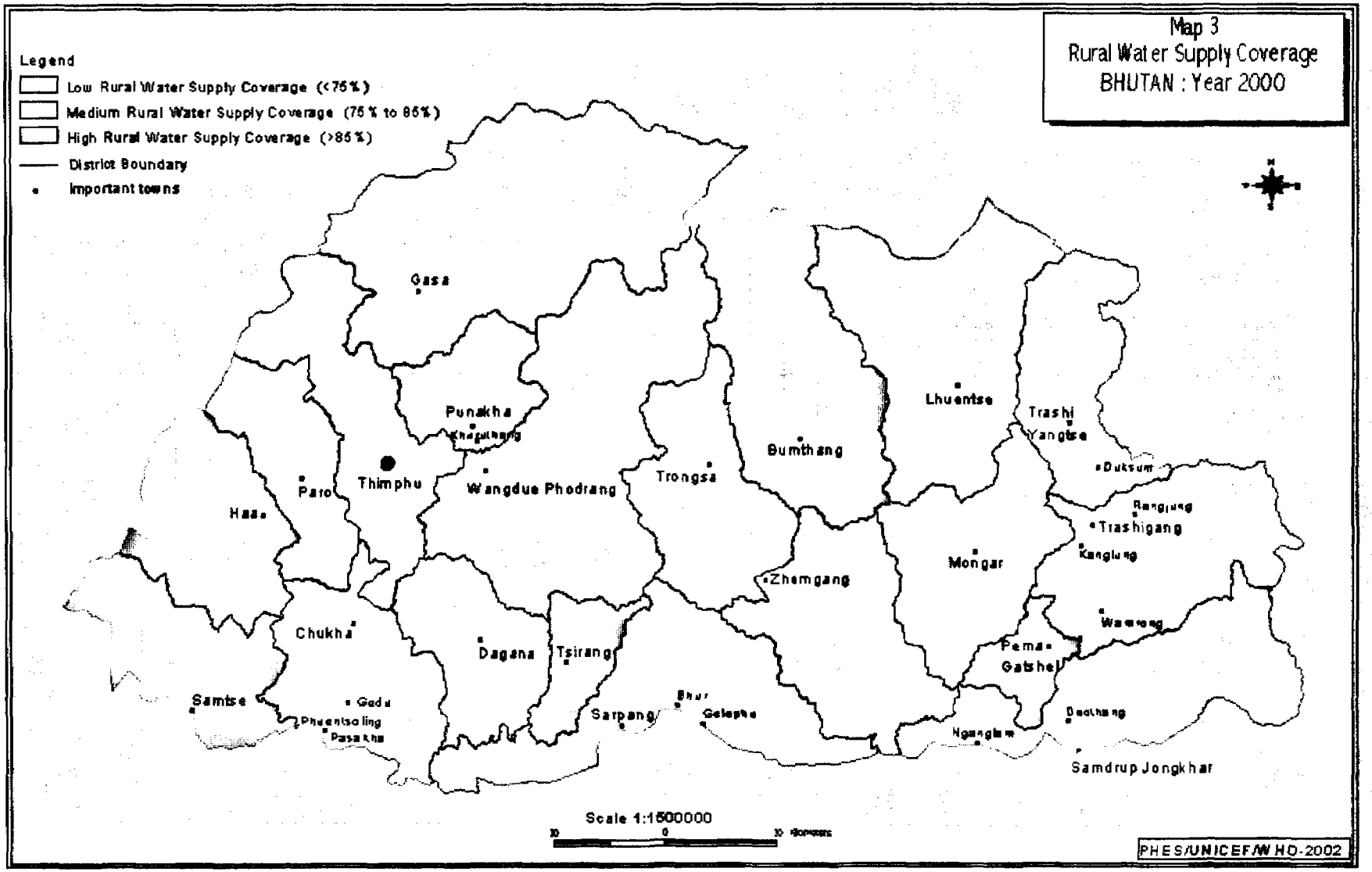
A large number of schemes reportedly are in need of rehabilitation and this brings about the issues of sustainability. Whilst age of the system may dictate the needs of rehabilitation, a host of other reasons also impact the life of the interventions made thus far. A step taken by PHES in this regard is the drawing up of a mechanism to be incorporated within the decentralization procedure where beneficiaries take full responsibility to the upkeep of the systems in place. This includes institutional strengthening and capacity building at the grass-root levels improving upon the present system of imparting skills and knowledge to community leaders, water caretakers and water and sanitation management groups. Besides the above, partial cost recovery principles could also be adopted for rehabilitated schemes besides the nominal contributions made by the water users so as to instill a sense of ownership of the water systems.

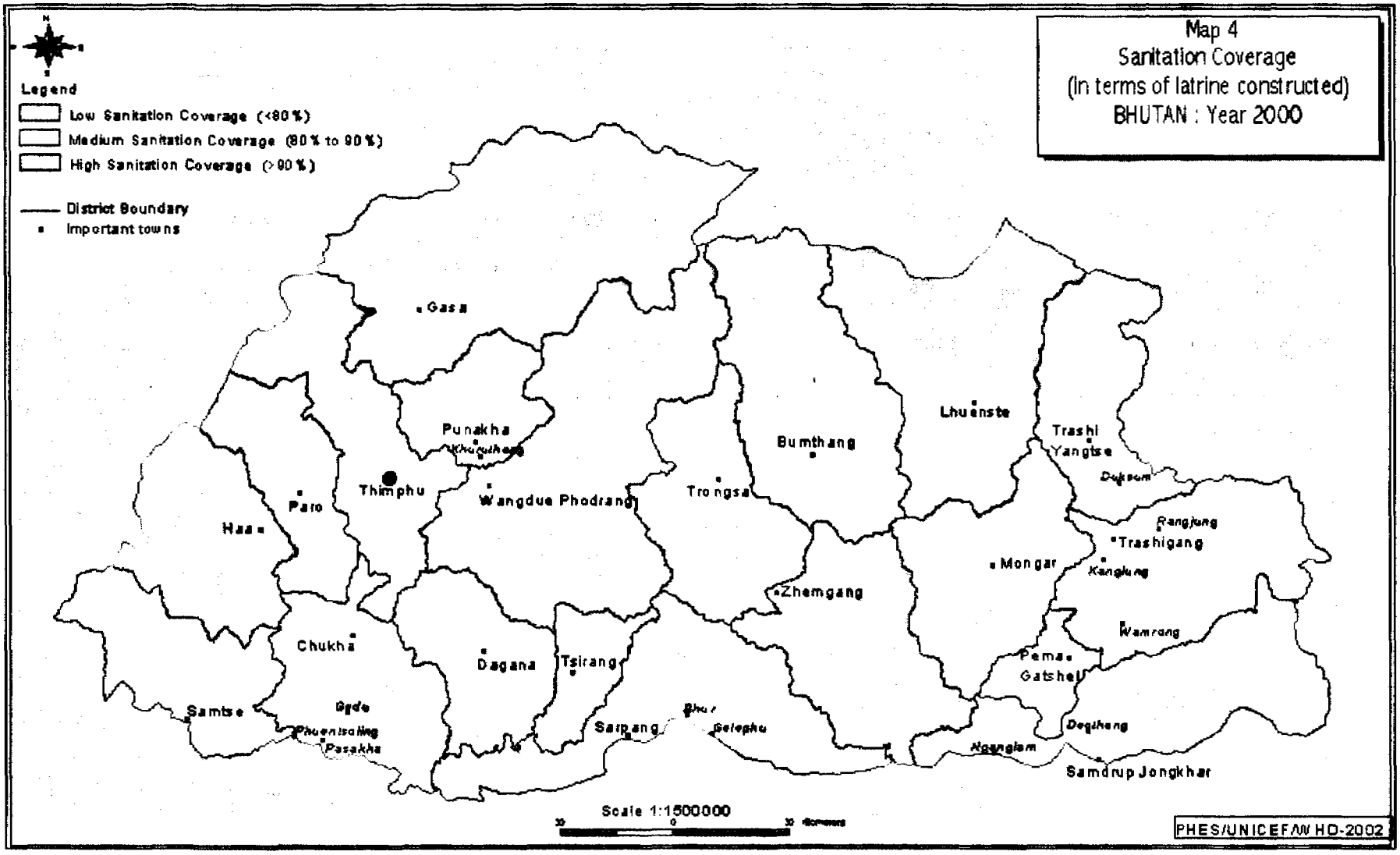
Water and sanitation activities of the ninth five-year plan (2002-07) should accord more priorities to districts with low water and sanitation coverage in order bring about equitable development in the general health and hygiene of the people. Although the task may be mammoth, a geog-level (block-level) study of drinking water and sanitation situation should be an immediate task in support of the enhanced decentralization policy and for better management of resources and implementation planning. The installation of water systems and sanitation facilities are by no means cheap and thus if preceded by more accurate surveys and more appropriate designs will offer considerable cost savings. Besides, better analyses of sector costs including overheads will provide more economy.

The Bhutanese economy is not fully independent as large proportions of the development capital investments are met from external sources of funding. The country will need to continue to seek the much-needed financial and technical assistance from external sources for some time to come in order to realize the development priorities set for the general welfare of its people. However, in view of the growing uncertainties of external funding and in the spirit of self-reliance, the national emphasis should be to generate more of the sector resources on its own.


Legend
District Boundary
Block Boundary
Important Town
Map 1
Political Map of Bhutan
N
W
E
S
GASA
PUNAKHA
THIMPHU
Thimphu
PARO
Paro
HAA
WANGDUE PHODRANG
Wangdue
Punakha
Khuruthang
BUMTHANG
Jakar
TRASHI YANGTSE
Yangtse
TRONGSA
Trongsa
ZHEMGANG
Zhemgang
SARPANG
Gelephu
DAGANA
Dagana
TSIRANG
Tsirang
CHUKHA
Phuentsholing
Gedu
Samtse
SAMTSE
MONGAR
Mongar
TRASHIGANG
Trashigang
Kanglung
Lhuentse
Pema Gatshel
SAMDRUP JONGKHAR
Samdrup Jongkhar
Deothang
Nganglam
Scale 1:1500000
PHES/UNICEF/WHO-2002


Legend
Altitude Classes
0 to 1000 m
1000 to 2000 m
2000 to 3000 m
3000 to 4000 m
4000 to 5000 m
> 5000 m
National Park and Wildlife Sanctuary
Main Rivers
Important Town
Map 2
Physical Map of Bhutan
Kula Kangri
7532 m
Masangang
7194 m
Jigme Dorji National Park
Gangkar Puensum
7561 m
Gasa
Jhomolhari
7326 m
Bumdeling Wildlife Sanctuary
Lhuentse
Trashi Yangtse
Punakha
Khuruthang
Thimphu
Paro
Haa
Wangdue Phodrang
Bumthang
Trongsa
Trashigang
Rangjung
Mongar
Thrimshing La National Park
Sakteng Wildlife Sanctuary
Jangtong
Wamrong
Zhemgang
Black Mountain National Park
Chukha
Dagana
Tsirang
Pema Gatshel
Khaling Wildlife Sanctuary
Samtse
Gedu
Phuentsholing
Pasakha
Sarpang
Gelephu
Royal Manas Wildlife Sanctuary
Phibsoo Wildlife Sanctuary
Deothang
Nganglam
Samdrup Jongkhar
Scale 1:1 500000
PHES/UNICEF/WHO-2002


Map 3
Rural Water Supply Coverage
BHUTAN : Year 2000
Legend
Low Rural Water Supply Coverage (<75%)
Medium Rural Water Supply Coverage (75% to 85%)
High Rural Water Supply Coverage (>85%)
District Boundary
Important towns
Gasa
Punakha
Thimphu
Paro
Haa
Wangdue Phodrang
Trongsa
Bumthang
Lhuentse
Trashi Yangtse
Dukum
Rangjung
Trashigang
Kanglung
Mongar
Zhemgang
Wamrong
Pema Gatshel
Chukha
Dagana
Tsirang
Samtse
Gedu
Phuentsoling
Pasakha
Sarpang
Bhur
Gelephu
Nganglam
Deothang
Samdrup Jongkhar
Scale 1:1500000
PHES/UNICEF/WHO-2002


Map 4
Sanitation Coverage
(In terms of latrine constructed)
BHUTAN : Year 2000
Legend
Low Sanitation Coverage (<80%)
Medium Sanitation Coverage (80% to 90%)
High Sanitation Coverage (>90%)
District Boundary
Important towns
Gasa
Punakha
Thimphu
Paro
Haa
Wangdue Phodrang
Trongsa
Bumthang
Lhuentse
Trashi Yangtse
Dagana
Tsirang
Chukha
Samtse
Sarpang
Zhemgang
Mongar
Trashigang
Pema Gatshel
Samdrup Jongkhar
Scale 1:1500000
PHES/UNICEF/WHO-2002

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