Brief Report on State of the Environment

National Environment Commission
Thimphu

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1. Introduction

Bhutan is situated in the Eastern Himalayas and its fragile mountainous ecosystem makes it vulnerable to changes in the state of its natural environment. The conservation of the natural environment is highlighted as one of the four pillars for "Gross National Happiness," Bhutan's development philosophy that has gained much international acclaim in recent years. The preservation of the country's rich natural resources can be attributed to the enlightened leadership of His Majesty King Jigme Singye Wangchuck and the strong conservation ethic of the Bhutanese people. In spite of the increasing pressure from socio-economic development and modernization, the conservation of its natural resources continues to be a priority for the Royal Government.

The Royal Government has mandated the NEC to assess the impacts of development and economic activities on the environment. In 2001, NEC published the first State of the Environment (SOE) Report for Bhutan**.** The SOE report is an important source of information for identifying gaps in policy-making, planning, development of future sector plans, particularly, the Five Year Plans and during planning and implementation of projects.

2. Purpose of the Report

This report presents a synopsis of the state of Bhutan's environment since the release of the first State of Environment report in 2001. It must be emphasized that the NEC has compiled this brief report to highlight the environmental impacts of socio-economic development in Bhutan. This report is intended to inform, sensitize, educate and facilitate better understanding of emerging environmental issues amongst the general Bhutanese populace and to draw the attention of the Royal Government to the fact that there is a need to recognize and respond to the cumulative impacts of economic development activities on our natural environment.

This report is in no way meant to discredit, criticize or prejudice any organization, plan, project or program of the Royal Government. Although the assessments and studies conducted to gather data and baseline information for this report are very preliminary and at times rudimentary, NEC has taken the liberty to use the data merely to point out trends in our natural environment.

3. National Policy and Legal Framework

The Royal Government of Bhutan has been making rapid strides in shaping the national policy and legal framework for the environment sector. Overall, Bhutan's environmental protection framework is sound in its scope and deeply-rooted in the rich traditions of the Bhutanese people and the far-

sighted visionary leadership of His Majesty. Upon this foundation and with the aid of external donors (Government of Denmark, Netherlands, UNEP, ADB, UNDP, GEF), a systematic environmental framework that enables the Bhutanese to consider sustainable development challenges in an integrated manner is now in place. The focus must now be on implementation, enforcement and compliance of the framework and cross-sectoral coordination and capacity building.

The National Environment Strategy (NES) "The Middle Path," is the main policy document for the environment sector. Designed to guide environmental conservation in Bhutan the Middle Path aims to minimize or mitigate the impacts likely to result from the development process. The NES is further supported by policies, strategies and action plans of the various sectors in the government.

3.1 International Obligations

Bhutan is an active member in international and regional environmental fora. Bhutan is signatory to 10 multilateral environmental agreements (MEAs) and participates actively in negotiations and programs related to the Convention on Biological Diversity (CBD) and the United Nations Framework Convention on Climate Change (UNFCCC). Under the UNFCCC, two pilot Clean Development Mechanism Projects in the energy (Micro-Hydel Project in Chendebji) and forestry sector (Afforestation Project in Paro) were initiated to assess costs and benefits of the carbon trade.

3.2 Legal Framework

The Environment Assessment (EA) Act was adopted in July 2000. Subsequently, the Regulation for the Environmental Clearance of Projects and the Regulation for the Strategic Environmental Assessment were adopted in 2002. Under the EA Act 2000, an environmental clearance is a prerequisite prior to the commencement of any development activity. The NEC published six sectoral guidelines in 1999 in close consultation with all the stakeholders. These guidelines were revised in 2003 and two new guidelines and relevant Environmental Code of Practices were developed. These guidelines will help stakeholders in understanding the environmental issues and in fulfilling requirements under the EA Act and the Regulation.

The NEC has also initiated the process of formulating a National Environmental Protection Act (NEPA). Legal analysis of laws and several stakeholder workshops have been held. Research findings on indigenous conservation principles have been published in the Indigenous Conservation Heritage of Bhutan.

4. Environmental Assessment and Monitoring

As the lead agency for the enforcement and implementation of the EA Act 2000, in 2003 alone, the NEC assessed and reviewed more than 164 development projects (roads, power transmission lines, industries, mines, urban development, etc.)

The NEC conducts environmental monitoring of all existing industries and mines annually. The NEC's continuous assessment and monitoring of all industries and mines in the country were compiled in successive Assessment Reports in 2000 and 2001. These annual Assessment Reports capture the trends in the growth of the industrial sector. The reports also highlight improvements in the occupational health and safety aspects and house keeping and material management in industries and mines since the NEC started its monitoring program. The cooperation of the private sector and industries in preparing these Assessment Reports must be acknowledged and appreciated. As a result of the close consultation by the NEC with the private sector, it is encouraging to see better environmental compliance.

Besides the NEC, agencies such as the Ministry of Trade and Industry, Ministry of Works and Human Settlement, Bhutan Power Corporation, Bhutan Electricity Authority and some private organizations have established environmental cells. Some of the environmental cells are designated as Competent Authorities under the provisions of the Regulation for the Environmental Clearance of Projects, 2002. The Competent Authorities are responsible for compliance monitoring of respective activities as listed under the Annex II of the regulation.

4.1 Environmental Awareness and Training Workshops for DYT and GYT Members

During the 8th Five Year Plan, the NEC conducted environmental awareness workshops for all the 201 *geogs* in Bhutan. These workshops were aimed at sensitizing grassroots communities to national environmental trends and issues. Furthermore, the NEC conducted 5 regional workshops for the *Gups* and *Chimmis* from the 20 Dzongkhags from November 2003 – March 2004.

The environmental awareness and training workshops were aimed at:

- Sensitizing the members of the DYTs and GYTs on environmental issues pertinent to Bhutan and the 9th Five Year Plan
- Training the members of the DYTs and GYTs in implementing the environmental provisions of the DYT and GYT chathrims
- Training the members of the DYTs and GYTs in implementing the EA Act 2000 and the Environmental Assessment Process
- Discussing the establishment of Dzongkhag Environmental Committees in each of the 20 Dzongkhags
- Finalizing pilot Geog Micro Environmental Action Plans in all 20 Dzongkhags for implementation

- Assessing capacity development needs of the DYTs and GYTs for sustainable resource management to implement environmental provisions of the DYT and GYT *Chathrims*
- To promote peoples' participation in environmental conservation

At the regional workshops, the heads of the DYTs and GYTs finalized micro environmental action plans for implementation in their Dzongkhags. Each Dzongkhag will receive Nu. 200,000.00 (Ngultrum two hundred thousand only) to implement these plans. These plans range from protection of watersheds and water sources, tree plantation and construction of solid waste disposal sites to protection of *Nyes*. The NEC is implementing these micro environmental action plans on a pilot basis right now. It is envisaged that the successful implementation of these micro projects will not only build donor confidence to fund bigger environmental projects in the *geogs* but also expose and educate the communities to funding sources that are available to fund such projects. The implementation of these micro projects, it is hoped will also lead to the inclusion of environmental plans and projects in mainstream geog and Dzongkhag planning.

The establishment of Dzongkhag Environmental Committees (DECs) was also discussed at the workshops. One of the most frequent criticisms received by the NEC is that the environmental clearance process takes too long and sometimes even delays the implementation of developmental activities in the Dzongkhags. In order to expedite the environmental clearance process, the NEC has proposed that DECs be established in all the 20 Dzongkhags to clear projects that have no significant impact on the environment (development of mule tracks, feeder roads etc. depending on the competency of the DECs). The DECs will also act as the watchdog of the NEC in the Dzongkhags. The NEC is currently mobilizing funds to train the members of the DECs in environmental impact assessments, the EA Act 2000 and environmental policies of the RGoB. The establishment of DECs is also intended to facilitate the Royal Government's decentralization policy. The members of the DYTs and GYTs have welcomed the proposal and are confident that the existence of DECs will expedite the environmental clearance process*.* About 10 Dzongkhags have already established DECs.

The DYT and GYT members expressed the usefulness of such workshops and recommended that NEC revisit the *geogs* to conduct such trainings and awareness raising exercises.

5. The State of Bhutan's Physical Environment

During the last decade, Bhutan saw an increase of 6.57 percent (NSB) growth in GDP due to rapid industrialization and urbanization and the secondary sectors. This growth in economic activity puts increasing pressures on the environment and natural resources of Bhutan. There is an urgent need for a comprehensive assessment of the environmental changes taking place in the

country. The demand and use of such information, at the policy level, is ever increasing and the availability of such information, at the national level, is a pre-requisite for sustainable management of Bhutan's natural resources. Such information is also vital for proper decision-making and planning future development programmes. The information below attempts to highlight environmental trends (focusing on air, water and land) in the country as a result of recent developments.

5.1 Air

Bhutan continues to enjoy relatively better air quality compared to other countries in the region. However, Bhutan cannot remain complacent, as air pollution is seen as an emerging issue, especially in the urban areas. This can be attributed to following:

- Industrial sector in Bhutan has grown by 216 % over a period of 5 years (NSB and MTI). For instance, from 1997 to 2002, the number of industries has increased from 4,394 to 13,908
- The number of vehicles has been increasing at a rapid pace (table 1). The pace of increase in number of vehicles over the period of 1985-2003 is about 11-17% (RSTA 2003) annually on average

The main sources of air pollution are from combustion of biomass for supply of domestic energy and agricultural activities, combustion of fossil fuels from vehicular emissions, industries and fugitive dusts from unpaved roads and new construction sites. Heating bitumen along road construction sites, where the fire is lit in an open space with an open saucer pan to heat the bitumen, also contributes to air pollution. In this process, there is emission from the combustion of biofuels as well as from the heating of the bitumen itself. Most of the satellite towns in Bhutan do not have proper waste disposal systems so the waste is burnt thereby polluting the urban air.

In order to overcome the emerging issues of air pollution, the NEC has initiated the following programmes:

1. Since 2002, the NEC has been measuring the ambient air quality (PM, NO2 and SO2) in Thimphu and Phuentsholing periodically
2. NEC in collaboration with MTI and Environmental Cells/Units of the industries has been monitoring industrial air pollution in Pasakha and Gomtu periodically
3. Pursuant to Male' Declaration on Control and Prevention of Air Pollution and Its Likely Transboundary Effects in South Asia, a transboundary air pollution monitoring station was established at Bhur, Gelephu, in 2002
4. Vehicular emission testing has started and the data is being collected for further analysis
5. Emission standards for industries (stack) are being revised

Table 1: Shows the increase in number of vehicles in Bhutan

Year of Registration	Number of Vehicles
2003	25,003
2002	24,460
2001	22,492
2000	19,260
1999	17,335
1998	14,206
1997	11,798

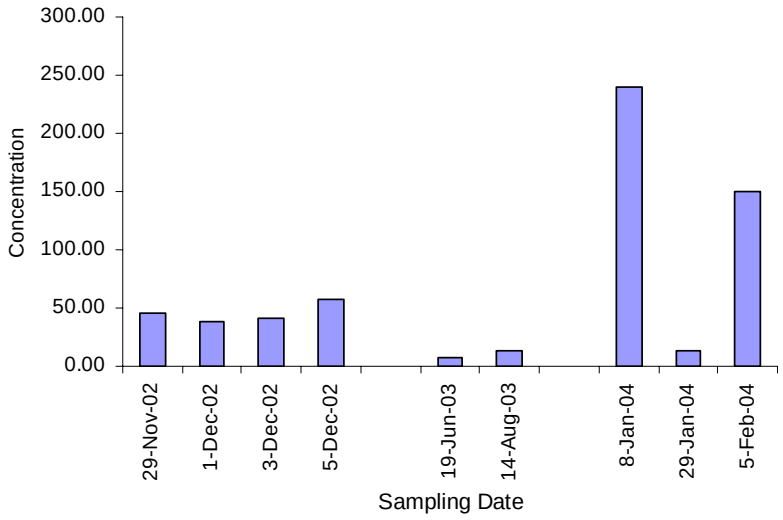
Source: 2004, RSTA, Thimphu

5.1.1 Results/Findings

Ambient Air Quality

Due to limited human resource and infrastructure, Bhutan has not been able to advance much in terms of ambient air quality monitoring. Nonetheless, the NEC has been monitoring ambient air quality in Thimphu and Phuentsholing since 2002. Figure 1 shows some results of the sampling done for Particulate Matter (PM10) in the premises of Tashichhoedzong.

Figure 1: Concentration of PM10 in μg/m^3. (The results of concentration are for 8-hours average)



Due to the lack of a permanent monitoring station, the sampling could not be done for 24 hours. The in-situ measurements in Thimphu show an observed maximum NOx concentration of 10.49 μg/m^3 and 7.14 mg/m^3 of CO. As per the WHO Air Quality Guidelines, the maximum allowable standards for TSP (total suspended particulates), NOx and CO are 150-230 μg/m^3 (averaged

over 24 hrs), 150 µg/m^3 (averaged over 24 hrs) and 10 mg/m^3 (averaged over 8 hrs) respectively. Therefore, the quality of air is fairly pristine except during the dry winter seasons (fig.1), where it is degraded by higher concentrations of particulate matter. This can be attributed to emission from source points, the constant winter high pressure system that sits over the South Asian region and temperature inversions during dry winter seasons. However, it should be noted that the above inference is based on preliminary results and further monitoring is being carried out by the NEC which would enable more detailed inference and more accurate results.

Vehicle Emissions

As of December 2003, more than 26,000 vehicles excluding armed force vehicles were registered in Bhutan. The present emission testing system has a number of drawbacks owing to which the system is not effective in reducing emission for on-road vehicles. Some of the associated problems with the existing system are:

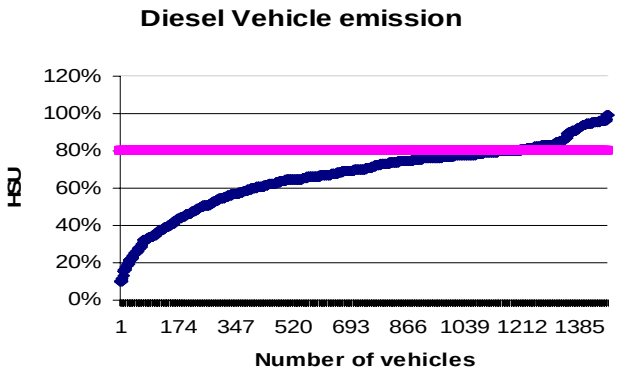
1. The test procedures currently used do not represent typical driving conditions and hence the measurement of emission levels cannot be used to generate an emission profile of in-use vehicle
2. The altitude factor – for instance, a vehicle undergoing emission tests in Thimphu and Phuentsholing, will have different levels of emission due to the altitude variation

The interim vehicle emission standards for Bhutan are given in Table 2.

Table 2: Interim Emission Standards approved by RGOBl

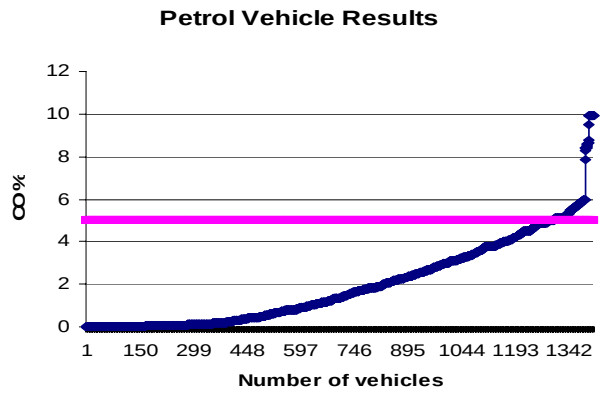
Type of vehicle	HSU	CO % Vol	Type approval
Petrol	-	5.0	Euro 1 or above
Diesel	80 %	-	Euro 1 or above

Fig.2: Percentage of vehicles tested in Thimphu against the emission standards for Diesel Vehicles



The results show that more than 16% of the vehicles tested have failed the emission standard.

Fig.3: Percentage of vehicles tested in Thimphu against the emission standards for petrol vehicles



The results show that more than 5% of the tested vehicles have failed the standard.

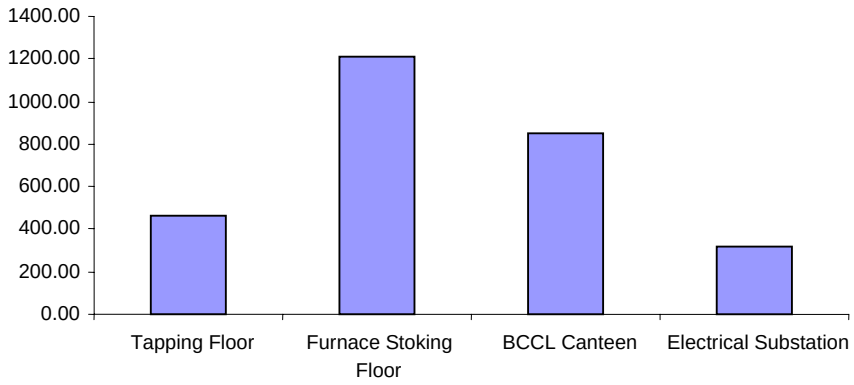
The NEC has been analyzing the data collected by RSTA to update Vehicle emission standards for Bhutan. In order to reduce the emission, it is important that the RGOB import superior quality of fuel.

Industrial Pollution

The main pollutants from industries are CO_2, CO, SO_2, NO_x, and particulate matter. Another problem with the industries is the lack of storage space for raw materials such as limestone, coal and charcoal. Most of the industries have low emission stack heights and as a result, emissions from them are not properly dispersed causing air pollution in the surrounding valleys.

Figure 4 illustrates the level of concentration of Total Suspended Particulates (TSP) in and around an industrial plant. The dataset is a product of joint monitoring conducted by the NEC, MTI and Environmental Unit of the BCCL.

Figure 4: Average TSP (micro gm/m^3) in and around BCCL Plant



It is evident from the above figure that the concentration of particulate matter in and around the industrial plant is quite high which is of concern. The readings at the Furnace Stoking Floor and the BCCL Canteen were above the the maximum allowable concentration of Total Suspended Particulates (TSP) as per the Indian National Ambient Air Quality Standards (is 500 µg/m^3 - average over 24 hrs). Similar levels of high concentrations of TSP have been observed in and around some other major industries as well.

5.2 Water

Recently the RGoB appointed the National Environment Commission (NEC) as the apex body for coordinating the management of water resources in the country. NEC, in collaboration with the Bhutan Water Partnership and relevant stakeholders has formulated the Water Policy, Water Vision and draft Water Act. Once finalized these policy documents will be submitted to the Royal Government for approval.

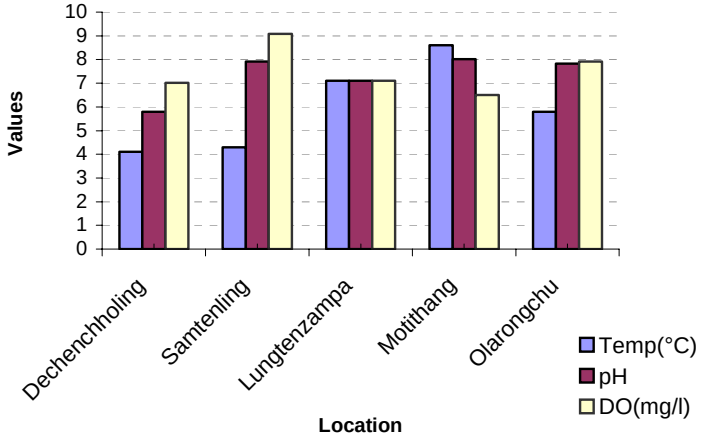
The National Environment Strategy highlights the importance of maintaining the integrity of Bhutan's watersheds and the need to protect our unpolluted water resources. The conservation of the wetlands and promoting integrated watershed development programmes must be given high priority. The effective participation of local people is seen as a key to preventing pollution of our water resources.

NEC has made a modest endeavor to monitor the quality of water of the nation's water bodies. Currently, water quality monitoring is being conducted in the four major river basins in Bhutan. Analysis of the water quality has been conducted at several sampling locations on the river basins including numerous tributaries.

In 1997, the NEC conducted a study to collect baseline water quality data to initiate the development of a national water quality database for major watersheds in Bhutan (NEC 1997). From 2001 - 2003 NEC collected baseline data and information and conducted water quality monitoring in the major river basins. Currently, similar data is being collected twice a year - wet and dry seasons. Monitoring is also done at facilities such as wastewater treatment plants and in industries.

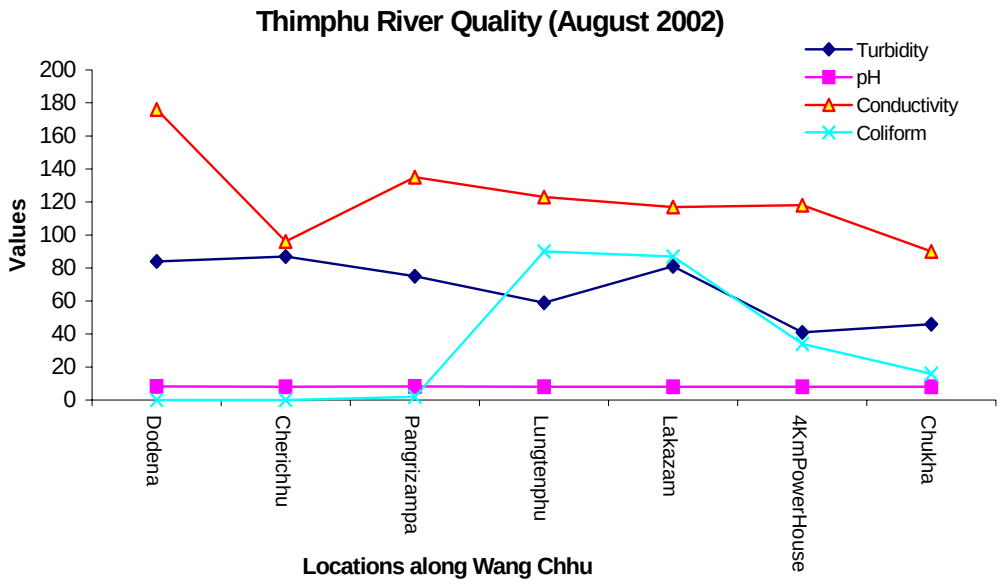
Based on the preliminary data collected by the NEC, it can be said that on a macro scale the state of Bhutan's water resources is very healthy. The data indicate that the main rivers and their major tributaries, with some exceptions, are still of a pristine quality. The natural water quality of Bhutan's rivers can be characterized as highly oxygenated, slightly alkaline with low conductivity and no recorded salinities. Figure 5 shows the consistently higher dissolved oxygen content water bodies around Thimphu.

Figure 5: Preliminary data for streams around Thimphu (January 2004)



However, there are localized pollution problems that need attention to avoid health problems and deteriorating recipient conditions. Chief among these are the unsanitary conditions found along the banks of streams and rivers both in urban areas and in rural locations. This problem is exacerbated at urban locations where surface drainage, oil and grease spills from workshops, grey water sullage from domestic households and uncontrolled seepage/overflow from septic tanks and piping flow directly into the rivers.

Figure 6: Preliminary Data for Thimphu River (2002) depicting, among others, the increase in Coliform count below the Sunday vegetable market



Both conductivity and turbidity is found to decrease downstream from Dodena. pH remains constant from Dodena all the way to Chhukha. Beyond the Sunday vegetable market, the Coliform count is found manifold times greater than the headwaters in Dodena. This can be attributed to the unsanitary habits of the people at the Sunday vegetable market. The Coliform count, however, decreases below Chhukha area.

NECS is also in the process of developing Appropriate Water Quality Standards. It is hoped that by the end of the Ninth Five Year Plan Bhutan will have Appropriate Water Quality Standards in place.

5.3 Land

According to the latest land-use survey, conducted by the LUSS (Land-Use Statistical Section), Ministry of Agriculture, based on the analysis of 1994 satellite data, the total area under forests is 29,045 km2 or 72.5% of the country, while the cultivated area accounts for only 7.8% (CSO 1997). As in other parts of the world, Bhutan is also experiencing land use changes due to a number of activities - both man-made as well as natural. Land degradation in the country is mostly manifested in the displacement of soil material through water erosion and internal biophysical and chemical deterioration. The rising population has aggravated the situation and will further worsen it if timely counter measures are not taken.

The NEC has recently made a preliminary analysis to assess the extent of land conversions due to various development activities in Bhutan. Allotment of government land to institutions total **1636.5 acres** so far. However, the total land use changes that have taken place is **24, 808.4 acres** (Table 3).

Table 3: Land use change as of April 2004

	Activity	*Area (acres)*
1	Land Allotment	786.5
2	Mines & Quarries	1599.4
3	Roads	7417.1
4	Transmission lines	12,454.0
5	THPA power evacuation, roads and dam	962.5
6	THPA land acquisition for civil infrastructure	1588.9
TOTAL		**24,808.4**

5.3.1 Land Allotted from Government Reserved Land.

As per the information maintained at the NEC and PPD, MOA, a total of **786.5 acres** of government reserved forest land has been allotted to different government institutions by the Coordination Committee of the Council of Ministers (CCM). The above total figure of land allotment includes **244.36 acres** of land that had been utilized prior to 2001 but given "post facto" clearances in 2003. This information is summarized year wise in the Table below.

Table 4: Year wise Summary of Land Allotment

Year	*Area (Acre) New*	*Area (Acre) post facto*	*Total area Allotted*
2001	40.86	-	40.86
2002	136.24	-	136.24
2003	365.07	244.36	609.43
Total	***542.17***	***244.36***	***786.53***

The field assessment documents available indicate that almost all land allotted has been granted from land classified as "barren" or "degraded forest". Only 2.9 acres was allocated from high forests.

5.3.2 Land Use Change for Roads

According to the Department of Roads, as of year 2001 there were **3,749km** of roads (national highway, district roads, feeder roads and urban roads) in Bhutan. A total of **128.5km** of new major roads is planned for construction by the Department of Roads during the 9th Five Year Plan.

Table 5: Roads in Acreage

	Road info source & year	*Km*	*Area in Ha*	*Area in Acres*
A	Road length as of 2001 (DOR)	3,749.00	2,999	7,407.5
B	Road clearances by Dept of Forests since 2001	365.11	2.92	7.2
C	Road clearances by NEC since 2001	487.07	3.90	9.6

Note: Area calculated by taking 8m as average road width

Taking an average of 8 meters clearance this covers more than 32km^2 of land area (4,000km x 0.008 km) under various types of roads.

In terms of number of clearances granted, a steady increase can be noticed annually. This is summarized in the table below.

Table 6: Environmental Clearance issued for Roads

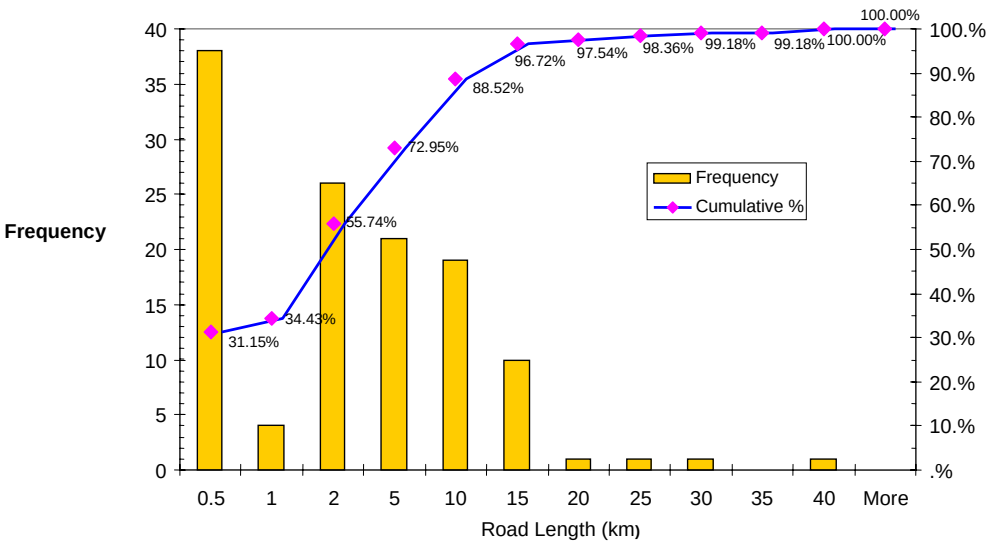
Year	1999	2000	2001	2002	2003	2004	Undated*	Total
Number of Clearances issued	2	8	24	31	31	22	18	136
Length of roads (km)	15.00	6.88	65.68	132.50	111.48	71.67	103.74	506.95

*Undated: Before enforcement of the EA Act, 2000

It is not known what type of land use systems are affected by these roads as this information is not available at NEC or Dept of Forests. Even though it is likely that a majority of the roads were constructed through forested areas, there is no information on the break up of area of roads that falls on other land use types such as agriculture land, pasture or barren land.

In terms of the types of roads reviewed for clearance, an analysis of 120 clearances from NEC reveals the maximum number of roads cleared are less than 20km in length with very few new roads being longer than 20km. About half of the roads are less than 2km in length and about a third are roads less than half a km (See cumulative frequency curve in the Figure below).

Figure 7: Frequency Distribution of Roads Lengths Cleared by NEC



Roads are important for the economic growth of the country but they have the largest impact on the environment in Bhutan. It must be noted that not only does the activity of road construction itself cause damage to the environment; long term impacts after the road is in place also have significant impacts on the environment. Besides landslides caused by construction and site

conditions, roads also open up previously inaccessible areas for activities such as logging for firewood, poaching, timber and quarrying, etc.

There is no particular pattern in the distribution of new roads, but Trashigang has constructed more new roads compared to other districts since 2001. The district-wise distribution of road length based on clearances issued by NEC since 2001[a] is summarized in Figure 8

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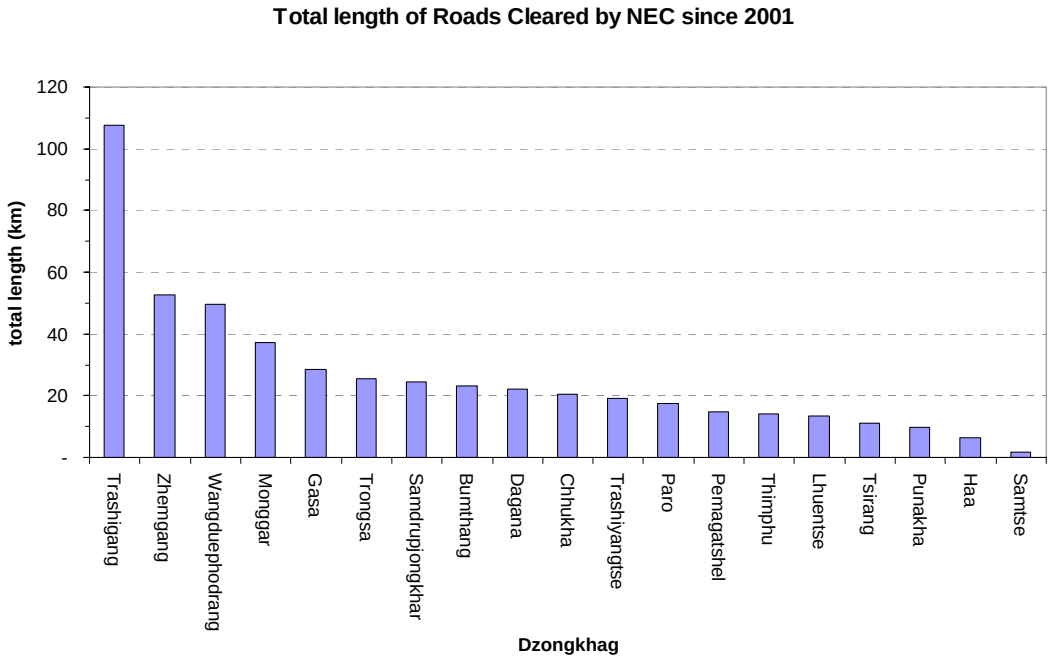
Figure 8: Total Length of Roads Cleared by NEC since 2001



5.3.3 Land Use Change under Mines & Quarries

According to the Division of Mines, Department of Geology and Mines (DGM) as of April 2003 there are 47 mines and quarries operating on a total land area of 644.309 Ha[b]. Information maintained by the EA Section, NEC shows that since the year 2001 a total of 34 mines and quarries were reviewed for environmental clearance. An analysis of the data from DGM revealed that most of the mines are in Samtse Dzongkhag which has more area under lease for mines and quarries than all other dzongkhags combined. This can be attributed to the location of mineral deposits and proximity to the major mineral processing industries in Bhutan located in Gomtu and Pasakha.

[a] EA Section NEC has a database of clearances issued for roads from 1999. Total road length cleared since 1999 till April 2004 is 507km. Information from year 2001 has been used to compare figures available from the Dept of Forests.

[b] List provided by Head of Mining Division on April 12, 2004, Dept of Geology and Mines, MTI

Table 7: Mines in Different Dzongkhags

Dzongkhag	# leases	Lease Area (Ha)
Samtse	25	391.83
Chukha	5	80.85
Paro	5	53.02
Thimphu	4	35.73
Sarphang	3	32.78
Pema Gatshel	1	26.77
Wangdiphodrang	3	21.13
Mongar	1	2.20
Total	**47**	**644.31**

5.3.4 Land Use Change under Power Transmission Lines

There is no information available on the actual area of forest cleared for constructing transmission lines. It is not known what amount of area falls in non-forest areas, nor has it been estimated how much area will or will not be cleared up to the usual right of way when towers fall on adjacent hilltops. To illustrate this, the EIA documents for transmission lines Evacuating THPA power only estimates that **6,192 trees** have to be felled.

Table 9: Land Cleared for Transmission Lines

Transmission lines	Area in km^2	Area in Ha	Area in Acre
Approximate total area for right of way for 2,017km of power transmission lines in Bhutan: (132 KV and 220 KV)	50.425 km^2 *(2,017km x 0.025km average width of corridor)*	5,042.5	12,454

5.3.5 Land Conversion under Tala Hydro Project[c]

The project covers a large area of land along the Wangchhu with several construction sites in packages awarded to different companies. Major surface works include the dam site, power yard and evacuation, roads and infrastructure to support the project. As per the Divisional Forest Officer, Gedu, the project has acquired **1,588.95 acres** of land covering both the forest and private land.

[c] Based on information gathered by NEC, as of August 2003.

In addition, direct project activities have the following changes in the existing land uses:

Table 10: Land use under various Project Activities

Activity	***Area in acres***
Power transmission lines THPA to India	920.00
Construction of Pothead yard	5.24
Construction of Sub-station at Malbasay	9.00
Approach road construction to Malbasay Sub-station	3.60
Submergence by THPA Dam	24.71
Total	**962.55**

Therefore, the total land use change is projected over an area of **2551.5 acres** (962.55 + 1588.95) covering both forest and private cultivation land.

It is not known what percentage of actual forest coverage has been affected without access to mapping and GIS resources. However, as of year 2000, the project reported felling a total of **19,649 trees** in the project site. The project at the recommendation of the NEC has also started compensatory plantation work along road sides and erosion-affected sites and has so far invested Nu.700,000.00 for such plantation work.

The above information indicates more and more land use change is taking place, including loss of forest area, due to infrastructure developments.

6. Conclusion

1. It is evident that along with the growth in the economy there is now increasing pressures on our environment and natural resources. As the agency responsible for monitoring environmental issues in Bhutan, the workload of the NEC is also ever increasing. Therefore, it is equally important to ensure that the resources, both human and financial to ensure effective monitoring of the environment are commensurate with the NEC's mandate.

2. Growth in urban areas, population, and increasing infrastructure is fast becoming one of the major emerging issues for the environment and natural resources management in Bhutan. Pressures in urban areas manifest in the form of converting prime agricultural land for infrastructural development, increasing pressures on surrounding forests and watersheds, and inadequate waste management. It is important to consider these increasing pressures in planning and development of urban centers. Urban planning should include measures for managing issues such as air pollution, solid waste management, protection of water bodies, and protection of critical watersheds.

3. The preliminary data analyzed by NEC on land allotted by the government for various developmental activities indicates that a substantial proportion

of forestland, agricultural land etc. is converted to other land uses every year. In order to ensure that more than 60% of the country remains under forest cover at all times, the Royal Government needs to be more cautious and rigid in its land allotment policies.

4. Increasing economic development has also meant increasing demands for access to markets through construction of different types of roads. The impact from roads come not only from the construction of the roads itself but by opening previously inaccessible areas to potential exploitation for natural resources. There is increasing evidence that environmentally friendly road construction (EFRC) methods are cheaper in the long run and also have significantly less impacts on the environment. Presently, the problem with implementing EFRC in Bhutan is that while the initial investment costs are higher such differences are not considered when resources are mobilized. Initiatives such as the EFRC project must be encouraged as there will be increased acceptance and decrease in costs as awareness and knowledge of these techniques replace conventional methods of road construction. The use of bitumen emulsions instead of traditional bitumen (tar) should also be encouraged. This will not only reduce air pollution along road construction sites but also bring about a drastic reduction in the demand for firewood besides also protecting the health of the workers.

5. There are many sectoral Acts and Regulations and policies that provide framework for the sound management and conservation of the environment in Bhutan. However there are constraints with regard to enforcement and compliance monitoring of such legislative frameworks as a result of limited human and financial resources in the sectors. There is a need for additional human and financial resources in the line ministries to effectively implement and enforce sectoral Acts and Regulations and thereby complement the efforts of the RGoB in conserving Bhutan's natural environment.

6. To ensure the sustainable management of our natural resources, it is of paramount importance that environmental issues are considered right at the planning stage of any project, program or plan (especially the Five Year Plans). This will ensure that appropriate environmental measures are in place to facilitate timely and sustainable implementation of developmental activities. This will also reduce mitigation costs during and after project implementation.

7. The system of documentation in all the agencies of the Government needs to be improved significantly. NEC's experience while gathering information for parts of this report clearly indicates that there are conflicting information and data on the same issue from various agencies of the Government. A systematic and standardized documentation and database management system needs to be put in place under a common system.

8. There is a need to further promote and support environmental education and training strategies for curricular and co-curricular initiatives in schools

and institutes so that the future guardians of Bhutan's environment have the knowledge, skills, attitude and commitment to contribute to the betterment of the environment.

More focus and resources are needed to create widespread environmental awareness among the general public in order to reshape the attitude of the Bhutanese people. An improvement in the attitude and civic sense of the Bhutanese will only come about through greater emphasis on public awareness campaigns and people's participation.