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BHUTAN

TRANSPORT SECTOR NOTE

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ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
BOT	Built Operate and Transfer
CAMP	Civil Aviation Master Plan
CSO	Central Statistical Organization
DANTAK	Indian Border Roads Organization
DOR	Department of Roads
EC	European Commission
EDIFACT	Electronic Data Interchange for Administration, Commerce and Transport
EFRC	Environmentally Friendly Road Construction
EU	European Union
FDC	Forest Development Corporation
FDI	Foreign Direct Investment
FY	Fiscal Year
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIS	Global Information System
GOI	Government of India
GTZ	German Technical Cooperation
HDM	Highway Design and Maintenance Standards Model
IDA	International Development Association
IFAD	International Fund for Agriculture Development
IFR	Instrument Flight Rules
ILO	International Labor Organization
ILS	Instrument Landing System
IMF	International Monetary Fund
IRI	International Roughness Index
JICA	Japan International Cooperation Agency
LMIC	Lower and Middle Income Countries
M&E	Monitoring and Evaluation
MOC	Ministry of Communications
MOF	Ministry of Finance
MOIC	Ministry of Information and Communications
MWHS	Ministry of Works and Human Settlement
Nu	Ngultrum (Currency of Bhutan)
NWF	National Work Force
PMC	Pre-Mix Carpet
Pkm	passenger-km
PPD	Policy and Planning Division
RAP	Rural Access Project
RGOB	Royal Government of Bhutan
RMP	Road Master Plan
RSTA	Road Safety and Transport Authority
SAARC	South Asian Association for Regional Corporation
SDC	Swiss Development Cooperation
Sida	Swedish International Development Cooperation Agency
SQCA	Standards and Quality Control Authority
SQCD	Standards and Quality Control Division
TA	Technical Assistance
TEU	20-ft Equivalent Unit
TMP	Transport Master Plan
TRL	Transport Research Laboratory
UK	United Kingdom
USA	United States of America
VFR	Visual Flight Rules
vpd	vehicles per day
WFP	World Food Program

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BHUTAN
Transport Sector Note

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Executive Summary

Landlocked Bhutan faces unique challenges and opportunities as it pursues the development of its transport sector into the 21st century. Bhutan's population growth rate is high, rural-urban migration is accelerating, and fueled by sustained economic growth, the country is urbanizing rapidly. The continuing investment in education, health and social welfare is giving rise to an expanding urban middle class with rising expectations of well-paid employment, access to efficient services and cultural amenities, and consumerism.

Accessibility is the defining development issue in Bhutan, be it access to opportunity, enterprise, markets or services. And, accessibility to a large measure depends on availability of appropriate, reliable, and affordable transportation. Poor rural access is synonymous with rural isolation and poverty in Bhutan, while high external and domestic transport costs constrain the country's economic and social development. Transportation poses a considerable cost disadvantage to business and commercial undertakings; road transport is slow and regularly disrupted by landslides and flooding, especially during the monsoons; air transport is costly and disrupted by erratic weather conditions. Costly transport is a major factor constraining the development of tourism, horticultural exports, and agro-processing and wood-based industries.

Government's Transport Sector Strategy

RGOB's development strategy for the transport sector, based on a comprehensive vision statement of Bhutan's future - *Bhutan 2020: A Vision of Peace, Prosperity and Happiness* - has three broad objectives:

- To facilitate balanced regional and urban development, support internal trade and commerce, and integrate the relatively isolated central and eastern regions with the rest of the country.
- To reduce the cost of international transport and improve the logistics of international trade and commerce.
- To improve rural accessibility (especially access to markets, employment, and education, health and social services) in an environmentally sustainable and socially responsible manner.

Transport Sector Issues and Options

Provision of transport infrastructure and services in the Bhutanese context is costly, as transport demand is feeble, transport markets are weakly developed and not subject to competitive pressures, and the transport industry is still in its infancy. Thus, provision and management of transport infrastructure and services is expected to remain in the public domain for the foreseeable future. The efficiency of public provision will depend largely on how well RGOB is able to create market surrogates in the transport sector, relying mostly on competition for the market. Other important considerations include integration with regional and global markets, sector organization, factor productivity, technological choice, and management and prioritization of public expenditures, including cost recovery and subsidies. Sector issues discussed in the following sections emerge from a detailed assessment of the transport system (para. 5-30) and an analysis of public expenditures (para. 31-48).

(i) ***Rural Accessibility:*** The RGOB strategy for improving rural accessibility, as elaborated in the 9th Plan, focuses on physical access—walking time to the nearest road—and the central role of roads and motorized transport in integrating remote regions and communities into the national economy. The intention is that by 2012, 75% of the rural population will live within half a day's walk from the

nearest road. This strategy responds to a strong consensus among rural communities -- the preparation of the 9th Plan involved communities at the block (Geog) and district (Dzongkhag) levels, and almost uniformly, the first priority of communities was road access. Future plans to improve rural accessibility should consider a broader array of policies and programs, integrating telecommunications, information technology, warehousing, buffer stocks, and hostelling with transport infrastructure and services. This will make the provision of feeder and rural access roads even more effective in reducing rural isolation and improving the economic and living conditions of the rural poor. With respect to rural transport interventions, the objective should be to integrate all viable alternatives, from trails and footbridges to air transport into a least-cost service network that is regionally balanced and is safe, convenient, and economical to use (para. 50-51).

(ii) ***Access to Regional and Global Markets:*** To ease the constraints resulting from Bhutan's landlocked and mountainous location, the development of the soft side of trade related transport logistics, such as harmonization of documents and procedures, needs greater attention. Specific transport actions could include: (a) technical support for development, operation, and management of transport logistics; (b) establishment of a dry port in Phuentsholing with reefer storage facilities; and (c) internationally competitive Druk air cargo rates, especially for exports of perishable and high value agricultural products. In the medium term, RGOB may consider fully integrating its airport and air navigation facilities with India and seek operating rights at Indian airports such as, Bagdogra and Gauhati, and eventually Hasimara (once it is opened to civilian use) for direct-chartered cargo flights to Europe, South East Asia, and Middle East (para. 52).

(iii) ***Transport Sector Planning and Coordination:*** The Road Master Plan (RMP) and the Aviation Master Plan (AMP) will provide the strategic tools to guide the development of the transport sector over a longer time horizon (2020). As the most obviously needed roads are built and bottlenecks begin to emerge in the transport system (signaling the need for road and bridge widening, higher roadway geometric standards, and improved and shorter road alignments), systematic economic appraisal of transport projects is needed to permit an adequate judgment about expenditure priorities between transport and other sectors, among transport sub-sectors (modes), and within a sub-sector such as roads. Transport investments in Bhutan fall in two broad categories: those where investments follow actual and/or predictable transport demand (mostly in established transport corridors), and those where transport investments, whether singly or in concert with investments in other economic and social sectors, are expected to stimulate transport demand. In either case, the key objective of planning is to meet the transport demand, actual or latent, at the lowest cost to society (i.e. the sum of economic, social, and environmental costs). Thus it is essential that a cost-benefit framework be introduced to evaluate future investment proposals in the transport sector. There is little evidence of economic prioritization in the planning process for the 9th Plan. Regarding future transport investments (9th Plan and beyond), it appears that there is scope for changing the modal share, with a larger proportion of expenditures directed at domestic aviation and urban transport infrastructure. This report includes specific policy, planning, and investment recommendations for **roads** (para. 54-56), **air transport** (para. 57)**, urban transport** (para.58), and **road transport services** (para. 59). Given the urgency of the emerging urban transport problem, priority should be given to preparation of comprehensive urban transportation plans for Thimphu and Phuentsholing. With respect to the Transport Master Plan (TMP), it is recommended that RGOB consider including in TMP a transport strategy and policy review to (a) identify and analyze emerging challenges and constraints in the transport sector; (b) recommend appropriate strategies and policies to address these concerns; and (c) prepare an implementation plan for sector modernization, including policy and institutional reforms.

(iv) ***Public Expenditures, Cost Recovery, and Subsidies:*** The transport sector accounted for a ten percent share of total public expenditures in the 8th Plan, with about 20 percent spent on recurrent expenditures. The 9th Plan aims at a similar allocation for the transport sector. Public expenditures on

transport will need to be sustained at this level or higher to achieve even the fairly modest transport sector targets envisaged in Vision 2020. The allocations for domestic civil aviation are low in terms of achieving broad-based accessibility objectives and a more balanced transportation system. Maintenance has been given adequate priority in funding in the 9th Plan, with no external funding envisaged for routine maintenance of roads. There are no major imbalances in various categories of road expenditures, but chronic shortfalls in pavement resurfacing expenditures has implications for the continued serviceability of the paved road network. Further improvements can be made in the planning and application of public expenditures to ensure value for money (para. 61). For example:

- Nearly 50 percent of transport expenditures in the 8th Plan period were spent on programs not included in the Plan but taken up on need basis. This calls for better prioritization at the planning stage and more rigorous programming and monitoring of annual expenditures, based on a multi-year rolling plan.
- There was a financing gap of about Nu 3.0 billion (45 percent) for road expenditures, at the start of the 9th Plan. Core expenditures to maintain and rehabilitate existing roads should take priority over new road construction. Routine maintenance should continue to have the first claim on RGOB's domestic resource (revenue budget) allocation for road expenditures.
- Repair of monsoon damage is an inevitable part of road maintenance operations but the amount of monsoon restoration works varies from year to year. DOR does not receive an annual allocation for monsoon restoration but must request funding on need basis from a contingency fund. This method of funding does not encourage DOR to systematically undertake preventive maintenance or replacement works; nor does it provide a basis for assessing the cost-effectiveness of such emergency expenditures. This activity should be accounted for in the DOR budget in the same manner as routine maintenance and resurfacing operations.
- The average cost of routine maintenance per kilometer in Bhutan is higher than in other comparable mountainous countries. Because of the relatively low quality of construction, the average service life of pavements is short despite low traffic volumes—new overlays are needed within three-five years compared to five-eight years in other comparable environments. There is clearly scope to improve the cost-effectiveness (quality and productivity) of road expenditures.

Taking into account all identifiable direct and indirect transport **user charges and taxes**, the revenue from the transport sector represents less than 20 percent of transport sector expenditures. According to the Road Master Plan (RMP), the total estimated revenue from 'real' road user charges (motor vehicle registration fees and sales tax on petroleum products) equals about ten percent of the amount required to maintain the country's roads and bridges (para. 62). It is also likely that airport fees and aircraft landing charges do not cover the expenditures on civil aviation infrastructure. While there may be limited scope for the introduction of transport user charges in Bhutan, it is important that this concept be introduced where feasible. As a first step, consideration may be given to:

- A surcharge on automotive diesel and gasoline: for example, an additional tax of Nu 5 per liter of diesel and gasoline should generate sufficient internal revenues to cover DOR's routine maintenance plus average monsoon restoration expenditures. Alternatively, the excise duties refunded by GOI on imported diesel and gasoline used by the transport sector could be earmarked to finance road maintenance expenditures.
- Tolls on: (a) shorter realigned sections (20-40 km length) of national highways to bypass existing narrow and winding sections with steep gradients and unstable slopes; (b) bridges improved and widened to reduce time delays and improve safety; and (c) the Tashichhodzong-Bebesa Expressway.

Despite the low level of cost recovery in the transport sector, transport providers and users benefit from both direct and indirect government **subsidies**; salient among these (para.63) are:

- An indirect economic subsidy of Nu 0.92 per revenue passenger-km to Druk Air. The beneficiaries of this subsidy are mostly foreign tourists and the better-off Bhutanese who can afford international air travel.
- An implicit annual operating subsidy to Bhutan Post of approximately Nu 150,000 per bus in 2002 for providing urban bus services in Thimphu. Although the users of this service include school children, there is no economic or environmental rationale for subsidizing urban transport services in Thimphu or other towns in Bhutan.
- An interest subsidy provided by RSTA to competitively selected bus operators for purchase of about 20 buses to provide services on unprofitable rural routes. This is a good example of a targeted subsidy based on the principles of competition for the market. A similar approach should be used for subsiding urban bus services if ever a case could be made for such subsidies in urban centers.

RGOB should establish a coherent and transparent cost recovery and subsidy policy in the transport sector, before transport subsidies become enshrined as public entitlements.

(v) ***Road Technology and Labor Productivity:*** Road building in Bhutan for the most part follows obsolete technology and archaic practices of a bygone era (circa mid-20th century), imported to Bhutan by Project DANTAK. Road construction and maintenance are characterized by labor intensive, low productivity, and high cost practices that result in poor quality roads with very high roughness, poor serviceability and short service life. The RMP provides a comprehensive review of these practices and provides recommendations for modernizing road technology in the Bhutanese context. These recommendations (para. 65) pertain to route location and hazard mapping (landslide and flooding risks), pavement construction and resurfacing technology, especially alternatives to bituminous pre-mix carpet (PMC), mechanization of road maintenance operations, and construction and maintenance quality assurance. One of the impediments to the modernization of road construction and maintenance in Bhutan is DOR's large labor force. The problem is compounded by a contracting industry with limited experience in mechanized road works. But given the labor shortage in Bhutan as well as its relatively high cost, DOR and its contractors have little choice but to mechanize road operations in order to contain costs and improve the efficiency of road expenditures. The other alternative will be to rely on imported labor from neighboring countries. The main issues are how to modernize construction and maintenance methods and how to shift from force account to contract works in a sustainable manner. A switch to mechanized methods requires more than procurement of necessary equipment; it requires a skilled labor force capable of operating and maintaining the equipment and supervisory staff who can make the most efficient use of the equipment. DOR employs a labor force of over 4600 to maintain a 2100 km road network under its direct charge. This averages over two employees per road kilometer, an excessively high labor deployment by any standard. At a daily wage rate (including benefits) equivalent to US$3-4 for NWF employees, there is little economic rationale for labor-intensive road construction and maintenance methods used by DOR By a judicious substitution of labor by equipment, DOR and its contractors could increase labor productivity by a large margin while reducing the cost of road works (para. 66).

(vi) ***Environmental Management:*** The Environmental Assessment Act of 2000 establishes the legal framework for environmental clearance of road projects of all types. The National Environmental Guidelines, supported by the Environmental Code of Practice developed by DOR, cover all stages of road projects from design through construction to operation, and apply to roads under all

jurisdictions. DOR with technical assistance under the ongoing IDA-funded project (and support from Netherlands) has introduced the so-called Environmentally Friendly Road Construction (EFRC) methodology for all its new road construction programs. Initial investment cost using EFRC is 25-30 percent higher as compared to the traditional approach, but EFRC is likely to be more economic on a life cycle cost basis due to lower routine maintenance and recurrent costs. While there is genuine enthusiasm in RGOB for application of EFRC to minimize environmental damage resulting from road development, and DOR has started adopting EFRC techniques in its road construction programs, its application is still at an embryonic stage (see Annex D). Little or no attention is paid by DOR to the use of these techniques in road improvement works (e.g., on the East-West Highway) and monsoon restoration works. There is a lack of experienced support and practical guidance to foster the application of EFRC by contractors and site engineers. Some immediate actions that DOR could consider to enhance the environmental quality of its road works are:

- Reassessment of road improvements consisting of minor realignments, as the cumulative negative environmental impacts of these improvements far outweigh the benefits in travel time savings (mostly negligible) and reduced accidents (mostly undocumented).
- Substitution of PMC by surface treatments and other appropriate pavement surfacing (such as machine laid asphalt concrete), as the current practice of roadside 'cooking' of bitumen and aggregate with firewood results in highly toxic smoke emissions that are injurious to human health. Furthermore, trees are felled to provide fuel wood.
- Use of appropriate plant and equipment: for example, substitution of crawler tractors by hydraulic excavators for earthworks, use of wheel loaders instead of crawler tractors to clear slips, and use of mini-pavers and pavement recycling equipment.
- More aggressive application of bioengineering methods to stabilize slopes; and appropriate design of side and cross drainage to minimize erosion.
- Extension of EFRC methods and technologies to maintenance, monsoon restoration, rehabilitation, and improvement (widening) works.
- Use of concrete pavements, which may be a more attractive economic (on life-cycle cost basis) and environmental alternative for Bhutan's climatic and soil conditions.

Road building in Bhutan has resulted in few induced or irreversible impacts on natural habitats, biodiversity resources, and other environmental and cultural assets. The forest cover is currently estimated at over 70 percent of the land area and it is Government policy to retain a minimum forest cover of 60 percent. Despite this favorable record, it would be useful if MWHS/DOR invest in the preparation of a GIS-based inventory of ecological and cultural assets that might be vulnerable to future road construction and improvement programs. This task could be undertaken as a complement to the ongoing landslide hazard-mapping project.

(vii) ***Sector Management and Institutional Strengthening:*** Until June 2003, all transport sector functions were under the purview of the Ministry of Communications (see Annex C1). This has changed with the establishment of two new ministries: the Ministry of Works and Human Settlements (MWHS) and the Ministry of Information and Communications (MOIC). The Government policy in all sectors, including transport, is to concentrate on policy, planning and regulation, leaving operations to the private sector. RGOB has been in the process of redefining its role from that of 'provider' to 'enabler' of transport infrastructure and services. The staff complement of the transport agencies, especially DOR, has been considerably reduced and an increasing amount of road construction and maintenance work has been contracted to private contractors, in line with improvements in their financial capacity and technical capability. The achievement of transport outcomes articulated in *Bhutan 2020* will largely depend on the

capacity and reform orientation of transport sector institutions. A number of critical institutional issues are highlighted in this report, including the recent sector reorganization at the ministerial level; restructuring options (including partial or full privatization) for Druk Air, the public bus operations of Bhutan Post, and the Mechanical Cell of MWHS (para. 74); enabling sector legislation, in particular the passage of the draft Road Act by the National Assembly (para. 75); the role of the private sector, especially in contract maintenance work and provision of public transport services (para. 76), the future disposition of the National Work Force (para. 77), asset management systems for DOR and RSTA (para.78), and human resource development needs of sector institutions (para. 79-80).

BHUTAN
Transport Sector Note

1. Wedged between China and India, landlocked Bhutan faces unique challenges and opportunities as it pursues the development of its transport sector into the 21st century. Geology, topography, and climate have contrived to make the building and operation of transport infrastructure a very difficult and expensive proposition in Bhutan. Its landlocked location increases both transport and construction costs due to the higher cost of machinery, materials, and other inputs. Its dispersed and low-density population scattered in small and remote settlements defies a planner's goal of creating an integrated transport network. The aggregate demand for transport services is weak and small in scale; at face value, few transport investments in Bhutan would be economically justified if the metric of consumer surplus alone were used as a measure of benefit. Protection of its fragile and pristine environment adds to the cost of providing transport infrastructure but should pay rich dividends in terms of total life cycle costs.

2. Bhutan's population growth rate is high, rural-urban migration is accelerating, and fueled by sustained economic growth, the country is urbanizing rapidly. The continuing investment in education, health and social welfare is giving rise to an expanding urban middle class with rising expectations of well-paid employment, access to efficient services and cultural amenities, and consumerism. But the country's economy is driven by the export of one major commodity - hydroelectric power and the country's development is mostly financed by external aid flows, particularly from its neighbor, India. Despite its sustained economic growth (six-seven percent per annum) and the emphasis on accumulation of social capital, the Bhutanese economy is characterized by relatively high wages (in relation to its neighbors) and low-productivity. The economy shows symptoms of the Dutch disease syndrome, which has undermined the competitiveness of non-power exports (through appreciating real exchange rates) and is limiting the development of a diversified employment-intensive economy. The trade regime has not been helped by the high cost of both domestic and external transport. Transportation poses a considerable cost disadvantage to business and commercial undertakings. Road transport is slow and regularly disrupted by landslides and flooding, especially during the monsoons; air transport is erratic and costly. Costly transport is a major factor constraining the development of tourism, horticultural exports, and agro-processing and wood-based industries.

Sector Strategy and Vision

3. The development strategy for the transport sector has three broad objectives:

- To facilitate balanced regional and urban development, support internal trade and commerce, and integrate the relatively isolated central and eastern regions with the rest of the country.
- To reduce the cost of international transport and improve the logistics of international trade and commerce.
- To improve rural accessibility (especially access to markets, employment, and education, health and social services) in an environmentally sustainable and socially responsible manner.

4. The expected transport outcomes have been articulated in a comprehensive vision statement of Bhutan's future—*Bhutan 2020: A Vision of Peace, Prosperity and Happiness*. By 2020, all Bhutanese, except those who choose to live in the most remote and isolated locations will have access to basic infrastructure associated with quality of life and expansion of choice and opportunity. Changes in economic geography will parallel changes in human geography. Thus, about one-half of the population

will be living in urban areas but unplanned growth of the urban centers would have been largely prevented. The nation's road network would allow faster and safer travel and would have additional trunk roads and an expanded system of feeder roads to help reduce rural isolation. Dry ports would expedite high value exports to distant markets and a well-equipped Paro international airport would help expand dependable links with the outside world. A growing system of civil aviation would contribute to economic and social integration of the country. *Bhutan 2020* includes a number of milestones to be achieved by 2020; namely,

- 75 percent of rural population living within half-day's walk from nearest road.
- National trunk roads upgraded to take 30-ton lorries and a second transnational highway completed.
- Dry ports constructed at Phuentsholing, Gelephu, and Samdrup Jongkhar.
- Domestic air services introduced and external air links upgraded to full Instrument Landing System (ILS) capacity.

Other related outcomes include:

- Horticulture exports increased by 300 percent and tourism revenues by 150 percent.
- Forest cover maintained at a minimum of 60 percent.

The Transport System

Infrastructure and Traffic Characteristics

5. Roads and tracks dominate Bhutan's transport system. There are approximately 4000 km of roads (60 percent paved)[1], 4,300 km of mule tracks, 242 motorable and 336 pedestrian suspension bridges. The country's only airport with a paved runway at Paro must operate under Visual Flight Rules (VFR) as it lacks ILS. There is a small airstrip at Yonphula (Tashigang District) that is seldom used, while helipads are available throughout the country. Scheduled air services from Paro (by the national airline, Druk Air) using two BAe-146-100 aircrafts link Bhutan with Bangkok, Yangon, Delhi, Kolkata, Gaya, Dhaka, and Kathmandu. Druk Air transports about 40,000 air passengers annually; about two-thirds of them are non-Bhutanese. There is no domestic air service. A fleet of 140 or so passenger buses is run by about 40 operators under a ten year contract—public transport operators are tax exempt and those operating non-profitable routes are provided a subsidy by RGOB. While ropeways are utilized they are not considered as a large-scale option for goods transport. There is one major ropeway (7.0 km long with a bucket capacity of 800 kg capacity) in Tashila, east of Wangdue, built in 1980-83 with Swiss assistance, for timber haulage and limited transport services to villages in the area. About half the country's population lives more than half a day's walk from the nearest motorable road. Excluding the 21 percent of population living in urban centers, less than 40 percent of the rural population lives within half a day's walk from the nearest road.

[1] Length of Classified Road Network, 2003

Road Class	Paved (km)	Unpaved (km)	Total (km)
Nat'l Highways	1559	19	1578
District Roads	360	99	459
Feeder Roads	401	926	1327
Urban Roads	91	1	92
Forest Roads	7	544	551

6. Bhutan has a road density of 0.1 km/sq. km (about the same as Nepal) and 5km/1000 inhabitants (assuming a population of 750,000), which is superficially high in comparison with other developing countries of similar size and population, and is explained by the low population density. The road density required to support economic production (at 3.7 km/$1 million GDP) is high, more than one-third higher than in Nepal (2.7 km/$1 million GDP). Transport on the existing road network is slow and fraught with the likelihood of delays and breakdowns. The roads are narrow, with numerous sharp curves and steep gradients, limiting speeds to 20-40 km per hour. Typically road distances are two to two and half times the straight-line distance between two points. Roads are often closed for several days by landslides during the monsoon and occasionally during heavy snowfalls. While over 60 percent of the network is paved, road roughness is very high on account of the prevalent road construction and maintenance methods, which often result in low quality of road construction and maintenance. The harsh terrain and extreme climatic conditions further complicate the situation. By international standards, more than a third of the road network in Bhutan is in very poor condition, and a significant majority in poor condition, resulting in very high vehicle operating costs. Routine maintenance is done on the entire network at an average cost of Nu 28,000 per km (about US$600/km) with year-round coverage. This outlay may appear high by international standards but is explained by the higher frequency of maintenance operations, inclusion of minor repair of structures and slide/snow removal in routine maintenance work, higher labor costs, and difficult terrain and climatic conditions (very high rainfall). DOR deserves praise for according high priority to routine maintenance in its spending priorities. Maintenance quality, however, could be further improved by the use of appropriate materials and maintenance technology. There is a growing backlog of resurfacing of the paved network, particularly for roads under the Directorate of Roads (DOR). Because of the relatively low quality of pavements, the service life of pavements is short despite low traffic volumes—on average, new overlays are needed within three to five years with the road falling into disrepair in seven to eight years.

7. The vehicle fleet has grown rapidly from about 13,600 vehicles at the end of 1997 to over 24,000 (light vehicles, 46 percent; trucks and buses, 18 percent; 2-3 wheelers, 36 percent) at the end of 2001, an average annual growth rate of over 15 percent. There are about 25 veh./1000 population, compared to about 8 veh./1000 population for South Asia. Light vehicles, particularly taxis, increased faster than the average growth in the motor vehicle fleet. Almost 90 percent of the vehicles operate in the western areas of Thimphu and Phuentsholing, with 70 percent of the trucks registered at Phuentsholing. Over two-thirds of the light vehicles ply in the capital area. Traffic volumes are highest in the vicinity of Thimphu and Phuentsholing, with the busiest section on the short stretch from Thimphu to Semtokha. Traffic on this section averaged 2,280 vehicles per day (vpd), excluding two-wheelers. The next highest traffic level, about 900 vpd, is on the Semtokha-Chuzom section, which is the common section of the roads to Phuentsholing and Paro (airport). Traffic then divides roughly equally, at about 450 vpd on the roads to Phuentsholing and Paro. On the East-West highway, traffic reaches 500-600 vpd from Semtokha to Wangdue, and falls markedly further east, with about 100 vpd to Trongsa and 50-100 vpd further east. Average flows are about 70 vpd on national roads, 23 vpd on district roads and 19 vpd on feeder roads. Over 50 percent of total traffic is carried on only 15 percent of the network. Traffic has been growing at 10-15 percent per annum on the Thimphu-Phuentsholing road and at over 20 percent per annum on the East-West highway. These traffic growth rates are not unexpected given the very low baseline traffic levels, and are likely to continue into the future at an annual rate of 10-12 percent with sustained economic growth and increasing urbanization.

8. Despite rapid traffic growth, the number of reported accidents (currently at around 250 per annum with some 15 fatalities) has been decreasing. Annual traffic-related fatalities at six per 10,000 vehicles are very low in comparison with lower/middle income developing countries, with as high as 100 fatalities per 10,000 vehicles. Besides low traffic volumes, slow speeds, and few pedestrians outside urban areas, other factors that have contributed to this favorable outcome include: pre-departure inspection of buses; regular roadworthiness inspection of commercial vehicles (every six months) and private vehicles (once a

year); regulatory limits on the operational life of buses and taxis (five years for Indian buses, seven years for Japanese mini-buses, eight years for taxis); the emphasis on driver education; and strict enforcement of traffic regulations by highway patrols operated jointly by RSTA and police. With increasing traffic volumes and speeds (partly because of geometric and road surface improvements – i.e. wider, straighter, and smoother roads), the low traffic accident and fatality rates may not be sustained for long on the Bhutanese road network.

Transport Sector Organization and Institutions

9. The Government policy aims to have the public sector concentrate on policy, planning and regulation, leaving operations to the private sector. The staff of the Ministry of Communications (MOC)—which was responsible for transport, urban development and housing, telecommunications, postal services, information technology, and construction industry development—was reduced from 2,171 persons in 1996 to 1050 in 2001, after the corporatization of Bhutan Telecom and Bhutan Post. Among transport agencies, the Department of Roads (DOR) has the largest staffing with 640 people, followed by Civil Aviation (141), Urban Development and Housing (102) and Road Safety and Transport Authority (106). In addition to its own staff, DOR employs 3,160 workers from the National Work Force (NWF) and 1,460 casual laborers, primarily for road maintenance works. To follow Government policy, DOR intends to replace force account operations by contract work. During the 8th Plan, about one-third of the road works were done by contract.

10. Since the construction of the first motorable road in 1959 and until the mid-1990s, most of the country's main road network was constructed and maintained by DANTAK (an organization under the Army Engineering Corp of India Border Force) and financed by the Government of India as grant. Some 30 percent of Bhutan's main road network (574 km of which 498 km are national highways, 62 km district roads, and 16 km feeder roads) is still maintained by DANTAK and funded by GOI, in addition to selected new construction and upgrading works. The Department of Roads (DOR) has direct responsibility for 2120 km (75 percent is paved), with the following distribution: national highways, 1062 km; district roads, 415 km; feeder roads, 554 km; and urban roads, 89 km. These roads are maintained through a field organization consisting of eight regional offices located at Thimphu, Lobeysa, Trongsa, Lingmethang, Trashigang, Mangdechu, Sarpang and Phuentsholing. The headquarters organization of DOR includes three divisions (Survey and Design, Road, and Bridge)—the Bridge Division has two sections for road bridges and pedestrian suspension bridges, respectively. The former Mechanical Division of DOR is now a self-accounting, corporate 'Mechanical Cell' in MWHS—it has two regional workshops and there is a Central Stores section.

11. Besides DOR and DANTAK, there are a number of other Government agencies involved in building and maintaining roads the main ones being the Dzongkhag administrations (131 km of feeder roads), and the Departments of Agriculture (126 km of feeder roads), Forestry (530 km of forest roads) and Education (38 km of feeder roads). Feeder roads have also been built in connection with the construction of hydropower stations (161 km) and communications facilities (68 km). These roads total over 1000 km, about twice the length of DOR feeder roads, and have somewhat lower standards than DOR feeder roads (see Technical Annex for details). The urban road system consists of about 90 km, most of which is paved. The construction and maintenance of mule tracks and suspension bridges is the responsibility of the concerned Dzongkhags, with technical support provided by DOR. The Dzongkhags also have the nominal responsibility for maintenance of feeder and farm roads constructed by other RGOB agencies.

12. The Mechanical Cell of MWHS has about 340 pieces of construction and earth moving equipment in two regional workshops at Hesothangkha and Lingmethang. At present, the division rents its equipment mostly to DOR for its force account work. Less than ten percent of its hire charge revenues

are from rentals to local contractors. DOR is being charged operating costs, fixed costs and the overhead of the division. The hire charges to outside contractors include depreciation and a five percent profit charge. This former Division of DOR had been operating as a commercial entity (on self-sustaining basis) since 2001 with no budget allocations from the Ministry of Finance. It is expected to become an autonomous state owned corporation in the near future. Much of the equipment was purchased in 1987-89 and is overdue for replacement.

13. The Department of Roads is also responsible for the management of the National Work Force (NWF) of about 4000 individuals, about equally divided between men and women and organized in permanent road camps. The NWF is a unique organization that employs family members (husband, wives, and adult children), and jobs can be voluntarily passed on by parents to their children. Most of the members of NWF comprise landless rural people or families that left their villages in search of work or educational opportunities for their children. The work force is deployed primarily for force account road construction and maintenance works, and has been supported by the World Food Program (WFP), which provides rice rations and other subsidized food items. The proceeds from the sale of subsidized food items are used to finance housing, schooling, sanitation, and safety programs for the NWF workers and their families. The workers also receive a regular Government salary. WFP food assistance for road works has been phased out from June 2004. RGOB has welcomed this development as NWF has become overly dependent on WFP's food assistance and this could affect the organization's long term sustainability. There is a growing recognition within RGOB that the NWF is not a very productive public asset; accordingly DOR intends to create incentives to help integrate NWF staff in the establishment of private contractors.

14. The Department of Civil Aviation operates the Paro airport. During the 8th Plan, the airport was improved both in term of facilities, with the completion of the new terminal building, the cargo complex and the control tower and in term of security, with the installation of passenger and baggage detecting equipment, airport security lighting and fire fighting and rescue service. Despite these improvements and in the absence of instrument landing facilities, the airport operates during daytime and only in fair weather conditions. Owing to high mountains on all sides in close proximity to the runway, Paro Airport is likely to remain a VFR facility with little or no benefit in upgrading the airport to an Instrument Landing System (ILS category I) facility because of the approach restrictions. However, developments in air navigation technology should be kept under review in the event that a technological breakthrough could help circumvent the approach restrictions.

15. The Ministry of Works and Human Settlement (one of the two successor ministries to the former Ministry of Communications) has two regulatory agencies responsible for development of construction industry, improvement of construction quality and enforcement of prescribed standards—the *Construction Development Board*, an inter-agency entity charged primarily with the registration, classification and performance monitoring of some 1700 contractors (of which 1300 are classified as petty contractors –Class D), and a growing number of mostly small private consulting firms; and the *Standards and Quality Control Authority (SQCA)*--formerly the Standards and Quality Control Division (SQCD)—charged with the development of engineering standards and codes of practice and ensuring quality control in construction. SQCA operates a central material testing laboratory and oversees seven sand and 18 stone quarries. The quality assurance work is facilitated by DOR's three regional laboratories.

Transport Services and Regulation

16. In order to streamline the transport system, all motor vehicle related activities including registration and licensing, roadworthiness and emission tests, and regulation of transport services were consolidated under the Road Safety and Transport Authority (RSTA) in 1997. RSTA delivers its services through four regional offices (Thimphu, Phuentsholing, Gelephu, and Samdrup Jongkhar) and eight base

offices. It regulates the road transport industry and sets tariffs, which are binding for passenger transport but considered indicative for freight. The transport tariffs are reviewed annually, and periodically adjusted as needed. There is no direct Government provision of freight and passenger services in Bhutan. Road transport costs are high in comparison with India and Bangladesh even after normalizing them for the steep gradients and poor road conditions.

17. In 1997, RSTA contracted out routes for passenger services to private operators through bidding. These contracts regulate frequency, quality of service and fares on each assigned route. At the end of 2001, there were 41 operators, including Bhutan Post, a state owned corporation. The number of buses and trucks operated as passenger vehicles under the ongoing ten-year contracts increased to 141 at the end of 2001; together they transported over 750,000 passengers. Bhutan Post and two private companies account for over 50 buses (20, 30, and 38-seaters). For services on non-profitable routes, the Government has offered interest free loans to operators for the purchase of about 20 buses.

18. Fares range from Nu 0.50 to over 0.93 (US cents 1-2) per passenger-km (pkm), depending on the seating configuration (higher for 20-seater than 30/38-seaters), terrain, and road quality of particular routes. Average fare on Indian roads in flat terrain is about Nu 0.3 per pkm. Affordability is an important criterion in rate setting by RSTA. While sustainability of the operators is carefully considered, RSTA attempts to keep fare rates at the lowest possible level. Since contracts were signed in 1997, fares have been revised regularly. On the whole, operators appear to cover their operating costs and some proportion of depreciation depending on firm size and its organization. For buses operated by Bhutan Post, the present fare structure only covers total costs with full occupancy of the buses. While occupancy is around 90 percent in the four winter months, it falls to only 30 percent to 40 percent the rest of the year. Smaller private operators are likely to have lower operating costs than Bhutan Post, because of lower overhead and staff cost. They have fewer buses and some are even owner operated. The Bhutan Post level of service is also higher as replacement buses are provided in case of mechanical failure, while other operators do not. Bhutan Post also sells bus tickets for part of the route, without assurance to find more passengers along the way. Private operators frequently charge the cost of the whole route, even to passengers traveling only part of the route.

19. The main problem faced by private bus operators is the maintenance of their vehicles. There is no after-sales service provided by manufacturers in India. Repairs in private local garages are often unreliable, spare parts are not readily available, and they are expensive. Forming a cooperative for the purchase of spares and tires may help, together with training of mechanics. Bhutan Post is using a former Government workshop with better installations than private garages, which work in open courtyards without any facilities or equipment. As mentioned before, RSTA imposes regulatory limits on the operational life of buses—five years for Indian buses and seven years for Japanese mini-buses. However, depreciation is allowed at only 15 percent per annum rather than at 20 percent for Indian buses. Operators would like to operate their buses longer. Because traffic is seasonal, there is excess capacity on some routes and sustainability of all operators on these routes is not proven yet.

20. The 2-axle, 6-wheeler Tata truck (4-8 ton capacity) is the mainstay of the trucking industry. The truck fleet numbers some 3500 vehicles. There are about 15 firms with 30-40 vehicles each. RSTA has established indicative domestic road freight rates according to carrying capacity and terrain, ranging from Nu 2.2-4.3 (US cents 4.5-9.0) per ton-km. Special rates apply for Government service. The typical freight rate on Indian roads in relatively flat terrain is about Nu 0.90 (US cents 2.0) per ton-km.

21. Bhutan Post, a government corporation, also operates an urban bus service in Thimphu , on behalf of the Government. The service operates ten buses during morning and evening peak hours, partly for the transport of school children. The Government bought the buses, and the fares cover about half the operating cost of the service, estimated at Nu 3 million in 2002. There are around 1400 taxis, over 1000

are registered in Thimphu and another 380 in Phuentsholing. Installation of fare meters in taxis became mandatory on December 1, 2002; metered fares average about Nu 8/km.

22. Druk Air, a state owned corporation operates two aging BAe 146-100 (respectively 15 and 12 years old), the first one entered service with Druk Air in 1988. Utilization of the planes is rather low at less than 2000 hours per year, because of the difficult flying and weather conditions. Maintenance of these aircraft is also expensive, as there are no spares readily available in the region. Most regional airlines operate Boeing or Airbus aircraft. The Government extended loans for the acquisition of the BAe aircraft, but so far Druk Air has not been servicing the debt. The Corporation basically covers operating costs but neither depreciation nor debt service. The estimated net loss (after depreciation) was about Nu 57 million in 2002. The occupancy ratio in 2002 was 64 percent, with about 62 million revenue passenger-km. Druk Air has signed a purchase agreement with Airbus to acquire two Airbus 319 aircraft to replace its existing fleet, with aircraft deliveries expected in October and December 2004.

23. The Government has approved the introduction of domestic helicopter service in the country. While some operators have expressed interest, they have not yet been able to fulfill the technical and financial terms and conditions. The short tourist season (spring and fall) is not conducive to developing a profitable year-round activity and costs have also been deemed prohibitive for emergency helicopter services. There is an expectation that non-scheduled commercial operations for local passengers could yield sufficient revenue to sustain year-round operations.

Trade and Transport Logistics

24. Bhutan trade suffers from the typical problems affecting all land lock countries requiring transit through neighboring countries, excessive delays through ports, inefficiencies at land border crossings, limitations on routes for transit cargo and on the use of their own transport companies. The competitiveness of local products on foreign markets is further reduced by the high cost of transport within Bhutan and the unbalanced trade flows, resulting in a shortage of back loads. Transit warehousing is lacking. There are no large-scale storage facilities for petroleum and associated products. There is sole reliance on Calcutta Port and the Phuentsholing transit corridor for international trade.

25. In the four years from 1997 to 2001, imports increased at 16 percent per annum while exports grew at two percent per annum, including electricity sales to India. India is Bhutan's dominant trading partner, accounting for 94 percent of Bhutan's exports and 80 percent of its imports in 2001. Trade with countries outside SAARC is accounted mostly by imports, while exports constitute about one percent of the total exports.

26. Export commodities fall in three main groups: foodstuffs and animals (22 percent by value), mineral products (16 percent), and manufactured products (62 percent). Of the first group, only fresh and prepared foodstuffs are exported to countries other than India and are dominated in both volume and value terms by oranges and apples to Bangladesh. There are in addition small flows to Japan and Southeast Asia of fresh and dried mushrooms and processed fruit juices. Mineral commodities are all shipped to India, Bangladesh, and Nepal generally from mines in the lower Himalayan foothills near the southern border of Bhutan. These are all low-value commodities with few prospects of export outside neighboring SAARC countries. Manufactured products include processed timber (logs and poles), ferro-silicon, handmade paper and paperboard, handicrafts, woolen carpets, and lemon grass oil. The last four items in this list have reasonably high value per ton and have found a market in Europe. In general, products with future export potential are comparatively few in number including processed fruits and oils, fresh and dried mushrooms, paper products, handicrafts and carpets. Prospective transport logistic improvements should be considered for these products, especially fresh fruits (pears, apples, plums,

peaches, grapes, strawberries, and cherries), fruit juices, and canned peaches for markets in Southeast Asia, and also for oranges and apples to Bangladesh.

27. In terms of international dry cargo flows, the imports from India (about 300,000 tons in1997) roughly balanced the export volume of 340,000 tons. There is, however, a large imbalance in tonnage flows between Bhutan and third countries (115,000 tons in imports vs. 30,000 tons in exports in 1997) with only about 20 percent container penetration. This imbalance is even more pronounced in the case of liquid cargo as all fuels are imported from India. With traffic so predominantly in one direction, transport costs are increased further as return loads are generally not available.

28. The latest agreement with India signed in 1995 for ten years still has two years to go. The transit agreement between Bhutan and Bangladesh has not been activated as trade between Bhutan and Bangladesh requires transit through India. In principle, Bhutanese trucks can carry goods directly to their final destination in India. However to avoid problems on the way, it is customary to trans-ship the goods to Indian trucks at the border. Cost of unloading and reloading were quoted in 1999 at Nu 1,200 to 1,500 per truck, equivalent to about Nu 150/ton. Phuentsholing is the main border post and over 80 percent of Bhutan's trade passes through here. Recently completed feasibility studies have concluded that commissioning of a dry port at Phuentsholing could serve as an effective stimulus to the development of Bhutan's foreign trade. The immediate benefit would be that goods could be shipped by container to and from Phuentsholing without the need for stuffing and destuffing in Calcutta port, thus reducing costs, avoiding delays or pilferage in port and providing greater security on the landside journey between Calcutta and Phuentsholing. Provision of reefers could facilitate export of fresh and processed fruits to India, Bangladesh, Thailand, Singapore, and Hong Kong. A further benefit would result from consolidation of cargo and use of larger trucks (at lower unit costs) for goods destined for Indian markets. The dry port would serve as a transit node in the transport chain to provide efficient and smooth transport logistics. The forecast cargo throughput is estimated at 2500 TEUs for imports (630 for exports) and about 700 reefer TEUs in 2002, increasing to 8500 TEUs for imports and 2500 reefer TEUs in 2012.

29. Little use is made of air transport for trade. Most air cargo is in the form of accompanied luggage or excess baggage of returning Bhutanese traders. Space would therefore be available for exports, particularly to Bangkok for high value commodities. In 1999, Druk Air charged US$4 per kg from Paro to Bangkok, the same rate as for excess baggage, when much lower rates were charged by other carriers on routes even as far as Europe. Currently, Druk Air operates twice a month cargo flights to Bangkok, subject to availability of adequate cargo volumes. More favorable rates for export cargo (lower than excess baggage rates) have also been introduced to take advantage of available capacity on outgoing flights. The problem of reliability, important for perishables like fresh mushrooms, remains, because of the frequent delays or cancelled flights due to weather conditions.

30. Tourism is still in its infancy although it is considered an important source of hard currency earnings. Tourist arrivals in 2000 numbered about 7560 (6560 by air and 1000 by land) and generated about US$10.5 million in revenue, or about US$1390 per tourist. Nearly 40 percent of the total revenue was accounted by Government royalties, at the rate of US $55-65 per tourist per night depending on the season. Excluding Indian visitors, USA, Japan, Germany, and United Kingdom accounted for the majority of tourists. A Tourism Master Plan currently under preparation with Austrian assistance should help in identifying an appropriate strategy to make Bhutan an even more attractive destination for high price, low volume tourism.

Public Expenditures in the Transport Sector

The 8th Five Year Plan (1997-2002)

31. Public expenditures in the transport sector averaged about ten percent of total public expenditures over the 8th Plan period (1997-2002). Capital expenditures accounted for 81 percent and current expenditures 19 percent. Roads absorbed 92 percent of all transport expenditures, followed by civil aviation (five percent) and transport services and regulation (three percent). In addition, the national budget provides an annual "interest" grant to Druk Air to cover the interest payment on its loans for airplane purchases. Provision for further loans have been made for the purchase of new aircraft. This level of public expenditure on transport appears high but is commensurate with the unmet accessibility needs and also reflects the high cost of infrastructure provision given the geology and topography of the country.

32. Overall, domestic revenues finance about half of RGOB's overall public expenditures, the other half being met by grants and to a lesser extent borrowings. GOI provides program and project grants, which in recent years have been equal to about 30 percent of domestic revenues. For the transport sector, RGOB financed 75 percent of the expenditures, while grants (20 percent) and loans (five percent) financed the remainder. The RGOB share includes program support from GOI—about 15 percent of total budget.

33. Road expenditures (by DOR) during the 8th Plan reached Nu 3.8 billion, exceeding the planned amount of Nu 3 billion by more than 25 percent. Major expenditure categories included: road construction, realignment and widening, Nu 1,480 million (39 percent); bridge construction and maintenance, Nu 554 million (15 percent); monsoon restoration works, Nu 490 million (13 percent); resurfacing, Nu 477 million (13 percent); routine maintenance, Nu 294 million (eight percent); and road administration, Nu 472 million (12 percent). Recurrent expenditures were within five percent of estimates, while capital expenditures reached Nu 3.2 billion, almost 40 percent above plan. Nearly one half of the public expenditure on roads, including Monsoon damage restoration works, was made on programs not included in the 8th Plan but on need basis. Routine maintenance expenditure (for 2090 km) averaged Nu 60 million per annum over the plan period. While this should be adequate, doubts have been expressed as to the quality of maintenance and the value of the works for the amounts spent. Much larger sums were spent on monsoon repairs than on routine maintenance, in part due to heavy damages in 2000/01, about double the annual average. Although some nominal allowance is made in the budget for such work, funds are provided on a need and emergency basis during and after the monsoon season. This practice does not provide an incentive to DOR to achieve a rational balance between preventive and corrective (emergency) works, nor is it possible to assess the cost-effectiveness of such emergency expenditures. Annual expenditure on road resurfacing fluctuated widely during the 8th Plan period from a low of Nu 57 million to a high of Nu 150 million, and was obviously affected by the level of expenditures on monsoon repairs, as both these expenditure items are funded from the revenue budget. Some 530 km of roads were blacktopped or resurfaced during the Plan period. But only 300 km of existing paved roads were resurfaced during the Plan period; that is 60 km annually compared to an average requirement of 200 km per annum, adding to the backlog of resurfacing needs. New construction and improvement works accounted for over 50 percent of total expenditure. The major part was spent on new feeder (85 km) and district roads (18 km). While only 3 km of new national roads were built, some 400 km were widened or improved through minor realignment works. Sixteen road bridges were built. In addition, 61 suspension footbridges and 323 km of mule tracks were completed during the Plan period.

The 9th Five Year Plan (2002-2007)

34. The 9th Plan goals include: improving quality of life and income, especially of the poor; ensuring good governance; promoting private sector growth and employment generation; preserving and promoting cultural heritage and environmental conservation; and achieving rapid economic growth and transformation. Achieving these goals would require infrastructure expansion, sound macro-economic policy, ensuring good governance, and improving access and enhancing social services. The 9th Plan explicitly recognizes the transport-poverty and transport-growth linkages and the resulting deficiencies. Planned transport sector expenditures are aimed at addressing these deficiencies.

35. The 9th Plan objectives for **roads and bridges** are: improving accessibility to social and economic activities by building more roads; and, enhancing the existing network with a view to reduce travel time, road user costs, and transportation costs for goods and services. The strategies to be followed for achieving these objectives include: promotion of private sector participation; mechanization of road construction, adoption of environmentally friendly road construction (EFRC) techniques; construction of highways and feeder roads; re-alignment of national highways; construction of double-lane highways and improvement of critical stretches; maintenance and stabilization of national highways; and replacement and reconstruction of bridges.

36. The objectives for **air transport** are: preparing a civil aviation master plan for guiding the development of air transport services; establishing a second airport in the country; introduction of domestic air services; and development of national institutional capacity for sustainability of these activities. The strategies to be followed for achieving these objectives include: establishing airport infrastructure; preparing a civil aviation master plan; and exploring the potential for domestic helicopter services.

37. The objectives for **road transport services** are the development of safe, reliable, efficient, and affordable passenger and freight transport services. The strategies to achieve this objective in the 9th Plan include: a focus on safety and environmental standards; and expansion of services through regulation and selective support of private transport enterprises. The 9th Plan also lays out clear initiatives for facilitation of trade and transport. These include EDIFACT (Electronic Data Interchange For Administration, Commerce and Transport) implementation, WTO accession, improving market access, and development of dry ports and other transit services.

38. For the transport sector, the **9th Plan expenditures** are projected at Nu 7.3 billion (US$153 million), slightly over ten percent of total public expenditures. The distribution among sub-sectors remains unchanged, with **road** expenditures accounting for over 90 percent of the total. The major expenses of **RSTA** (total Nu 252 million) would be for bus terminals and waiting sheds, traffic safety programs, and vehicle testing equipment. The RSTA program also includes preparation of a Transport Master Plan. Of the planned expenditures on **civil aviation** (Nu 404 million), over half of the total expenditures would be for the development and construction of heliports and resurfacing of a small runway in the east at Yonphula. The development cost of a new international airport is not included in the above amounts. A 1996 pre-feasibility study had estimated the cost at US$42 million (Nu 2 billion). Adjusting for inflation alone, the estimated cost would be about US$67 million today and possibly more, once final engineering is done. This would be close to half the total transport sector expenditure in the Plan period. The civil aviation master plan study will assess the feasibility and affordability of the new international airport. The Plan, in addition, provides for Nu 45 million for the **Standards and Quality Control Authority** for construction of central and regional material testing laboratories, procurement of laboratory and field-testing equipment, and capacity building. An amount of Nu 18 million is earmarked for the **Construction Development Board** for construction of office buildings, purchase of equipment and furniture, and capacity building in support of three main activities: classification and registration of

contractors and consultants, collection and dissemination of construction industry information, and administration of a construction-related arbitration system.

39. **Road expenditures (by DOR)** would amount to Nu 6.7 billion, a 72 percent nominal increase over actual expenditures in the 8th Plan. Recurrent expenditures are estimated at Nu 1,136 million (17.3 percent). There was a financing gap of Nu 3.0 billion (45 percent) at the start of the Plan period, although funding requests to GOI (Nu 1.1 billion) and Japan (Nu 0.30 billion) were in the pipeline. Funding sources for another Nu 1.6 billion had yet to be identified. The total planned road expenditure of Nu 6,660 million has the following distribution: new road construction, realignment and widening, Nu 3575 million (53 percent); bridge construction and maintenance, Nu 634 million (ten percent); resurfacing, Nu 1,100 million (17 percent); routine maintenance, Nu 819 million (12 percent); equipment, buildings etc, Nu 206 million (three percent), and road administration, Nu 300 million (five percent). The plan makes no explicit allowance for monsoon repairs (an estimated Nu 360 million). These could add about five-ten percent to the above total, although the risk is that these costs will be at the expense of other plan items such as resurfacing.

40. Planned expenditures on **routine maintenance** (2200 km of the road system) would be double those in the 8th Plan, even after allowing for inflation. RGOB intends to fund the this expanded routine maintenance program from its domestic revenues. The plan allocation, Nu 819 million over five years, is more than the routine maintenance needs estimated at Nu 545 million and would allow partial funding of monsoon repairs.

41. A substantial increase is planned in **resurfacing** (1000 km); however, this work is not funded yet, except for the ADB project, which will resurface 308 km of the East-West highway. For resurfacing, the allocation of Nu 1.1 billion over five years would match the requirements based on a seven-year resurfacing cycle. This means that, if achieved, the planned resurfacing would meet the needs for the period, but would not start reducing the backlog. As a result, about 40 percent of sealed pavements would become candidates for rehabilitation at the end of the 9th Plan period.

42. **New construction** is planned for 77 km of national roads and 123 km of feeder roads. In addition 15 km of 8th Plan spillover feeder roads will be completed. Out of the 77 km of national roads (funding requested from GOI), 32 km would be for the Wangdue-Khotokha road needed to access the new airport (if it were built during the plan period, which is doubtful, as foreign funding would have to be obtained). The other 45 km are for the road from Gomphu to Panbang in the southeast, which is a continuation of the road from Zhemgang further southeast along Trongsa Chhu (river) to the Assam border, with the aim to improve security by increasing access. The feeder roads construction program would be supported mainly by World Bank financing, leaving a financing gap of some Nu 200 million. The 9th Plan also includes: **realignment** of sections of the East-West Highway (32 km) and Phuentsholing-Thimphu Highway (25 km), shortening travel distance by 23 km on each of the two roads; **widening to two-lane standard** of the Confluence-Phuentsholing Highway (125 km) and the Bebesa-Paro Highway (48 km); completion of the Tashichhodzong-Bebesa Expressway, including three bridges; and geometric **improvement** of about 100 km of selected national highways to improve travel speeds and reduce accidents on critical sections. RGOB intends to fund from its own resources the realignment of East-West Highway between Nagar and Ura (32 km) at an estimated cost of Nu 325 million, and the construction of Tashichhodzong-Bebesa Expressway (6.1 km) for Nu 361 million. For the other realignment/widening projects (at an estimated cost of Nu 2,325 million), RGOB is discussing financing and implementation modalities with GOI. These expenditures are not included in the projected 9th Plan outlays.

43. RGOB also plans to request GOI funding of Nu 170 million for procurement of **construction machinery and equipment**, upgrading of **mechanical workshops**, and construction of **site**

accommodation and offices, including 150 dwellings with water supply and sanitation facilities for NWF.

44. The plan also allocates Nu 555 million for replacement of **eight major bridges** (Japanese financing); Nu 69 million for **replacement of seven wood/modular bridges** by Bailey bridges; and Nu 9 million for **maintenance of 147 bridges**—donor financing for the last two items is yet to be identified.

45. The 9th Plan outlays for transport also include Nu 74 million for construction and rehabilitation of about 100 **suspension footbridges** to be implemented by Dzongkhags/Geogs with financial assistance from Swiss Development Corporation (SDC)/Helvetas. The 9th Plan provides an initial allocation of Nu 235 million for about 230 km of **rural access roads** for implementation by the Department of Agriculture based on plans prepared by the Dzongkhags. The Plan target is to construct some 588 km of rural access roads. Other 9th Plan expenditures on farm roads and mule tracks by Dzongkhags, and on roads by the Agriculture, Education, and Forestry departments are not included in the above-mentioned Nu 6.7 billion outlay for roads.

46. The 9th Plan expenditures on **urban transport infrastructure** (roads, culverts, and bridges; traffic/road signs, parking areas, intersection improvements, street lighting, and footpaths, walkways, and footbridges) are included in the outlays for Thimphu City Corporation (Nu 247 million), Phuentsholing City Corporation (Nu 122 million), and in the Plan allocations for Dzongkhag towns.

Road User Charges and Cost Recovery

47. Although public expenditures on roads and road transport account for nearly ten percent of all public sector expenditures, there are no specific road user charges in Bhutan. The sales tax of five percent on fuels is equal to the general sales tax. Revenues from this tax were about Nu 31 million (less than three percent of the total transport sector expenditures) in 2000/01. Although most of the fuel is consumed by the transport sector, the tax is paid also on fuel used in agriculture and industry. Taxes on motor vehicles levied by RSTA, such as registration, annual license, etc., brought some Nu 67 million in 2001/02 (RSTA). Custom duties and sales tax on vehicles brought an estimated Nu 70 million in 2000/01. Except for the charges levied by RSTA, none of the other taxes are specific charges for road use.

48. Consideration should be given in the future to an additional fuel tax, which could be earmarked for road maintenance and Monsoon restoration expenditures. User fees have recently been introduced for water and sewerage and the RGOB is not opposed to user charges, including possibly for roads in due course. All fuel is imported from India as refined products and the marked difference between the price of gasoline and diesel (more than 50 percent) suggests that Indian taxes are already included in the price of imported fuels. Therefore, adding a further surcharge may be difficult at this time. It is estimated that a surcharge of Nu 5 per liter would generate revenues of Nu 170 million per year. This would have covered routine maintenance plus the estimated monsoon restoration expenditures in 2001/02.

Transport Sector Issues and Options

49. Accessibility is the defining development issue in Bhutan, be it access to opportunity, enterprise, markets or services. And accessibility to a large measure depends on availability of appropriate, reliable, and affordable transportation. The preparation of the 9th Plan involved communities at the block (Geog) and district (Dzongkhag) levels. There are 201 blocks and 20 districts. Almost uniformly, the first priority of communities was road access, followed by rural electrification. But provision of transport infrastructure and services in the Bhutanese context is costly, as transport demand is feeble, transport

markets are weakly developed and not subject to competitive pressures, and the transport industry is still in its infancy. Thus provision and management of transport infrastructure and services is expected to remain in the public domain for the foreseeable future. The efficiency of public provision will depend largely on how well RGOB is able to create market surrogates in the transport sector, relying mostly on competition for the market. Other important considerations include sector organization, factor productivity, technological choice, integration with regional and global markets, and management and prioritization of public expenditures, including cost recovery and subsidies. These and other related transport sector issues are discussed below.

Rural Accessibility

50. Improving accessibility is synonymous with reducing isolation. Strategies aimed at improving rural accessibility, as exemplified in the 9th Plan, focus on physical access—walking time to the nearest road—and the central role of roads and motorized transport in integrating remote regions and communities into the national economy, and the nation into the global economy. Although the primary emphasis is on physical rather than structural measures to enhance accessibility, this strategy responds to a strong consensus among rural communities. Future programs aimed at reducing rural isolation must take a multidimensional approach to social and economic integration and employ a variety of measures and interventions such as:

- Access to communications and information technologies; radio, TV, the telephone, and the computer can shrink space, reduce the need for trip making, and bring a variety of services (entertainment, distance learning, preventive health care, agriculture extension services, e-governance, and e-commerce) to the doorsteps of remote communities.
- Warehousing, buffer stocks (food, drugs, etc), cold storage facilities, and hostelling; these can be effective substitutes for all-weather motorized road access in terms of making markets, schools, and basic health services accessible to rural communities.
- Development and expansion of air transport services (including airborne emergency services such as flying doctors); this could be a more cost-effective alternative than extending feeder roads into the country's rugged and environmentally fragile terrain to link remote communities with district headquarters.
- Use of ropeways to transport cargo over escarpments and steep hills, and across gorges or deep valleys, especially in remote areas of high agricultural/forestry potential where road building is either not technically feasible or is prohibitively expensive. Ropeways for passengers would require expensive safety features, but could be justified in areas of good recreational (e.g., skiing) and tourism potential.
- Use of engineered high-class tracks (2m width) and appropriate stream crossing structures to allow wheeled transport, such as power tillers (with trailers) and two wheelers, as an intermediate stage between foot/mule tracks and motorable feeder roads.
- Bringing essential services to the communities, using periodic mobile camps or regular circuits by itinerant teachers, health workers, extension agents, and public administrators such as judges and land revenue officials (even if they have to travel on horseback); this approach may again be more cost effective than providing these services through fixed facilities, dependent on road access.

51. This is not to downplay the importance of all-weather road access in reducing rural poverty, expanding markets, and promoting commerce, only that provision of road access is only one measure among a host of technologies and approaches to reduce rural isolation and improve the economic and

living conditions of the rural poor. With sustained economic growth and rising incomes, it is not inconceivable that, long before 2020, Bhutan may have to employ first world technologies to respond to the rural accessibility challenge. Future programs to improve rural accessibility should be holistic and rely on a broader array of policies and programs beyond provision of rural roads to minimize rural isolation. This should take the form of an integrated *Accessibility Improvement Plan* for each Dzongkhag. With respect to rural transport interventions, the objective should be to integrate all viable alternatives from trails and footbridges to air transport into an integrated, least-cost service network that is regionally balanced, and is safe, convenient and economical to use.

Access to Regional and Global Markets

52. Besides the transport constraints resulting mainly from Bhutan's landlocked and mountainous location (distance from the nearest seaport—950 km from Thimphu to Kolkata, narrow and rough roads subject to closure during Monsoon, high road and air transport charges, lack of competition in air services to and from Paro, and specific transit difficulties in shipping horticultural exports through India to Bangladesh), significant production and marketing constraints will have to be resolved if external trade is to grow strongly in the future. Transport infrastructure improvements will help but are not likely to be sufficient in isolation. The development of the soft side of trade related transport logistics, such as harmonization of documents and procedures, will need closer coordination with neighboring countries. Specific transport actions to aid trade facilitation and logistics could include:

- Technical support for development, operation, and management of transport logistics, such as inventory and warehouse management and automation and demand consolidation as a cost effective means to counter its adverse trade characteristics (e.g., small back haul volumes, transfer of freight to larger capacity trucks at the border for onward transport to Indian destinations, negligible export volume).
- Establishment of a dry port in Phuentsholing with reefer storage facilities. The significant cost reduction from consolidation of break bulk shipments and containerization would be further enhanced if the Free Trade Agreement with India were modified to allow bonded transit of goods through India. Containerization would also help to increase fruit exports to Bangladesh by minimizing the incidence of disputes regarding product volume and quality. The size of the dry port facility and the ancillary services should be phased in with the pace of containerization.
- Since the air cargo traffic is unbalanced in favor of imports, it would be commercially favorable for Druk Air to offer lower rates to exporters. Air cargo rates for exports of perishable and high value agricultural products should be reduced, with particular reference to Paro-Bangkok route.
- In the medium term, RGOB may consider fully integrating its airport and air navigation facilities with India and seek operating rights at Indian airports such as Hasimara, Bagdogra, and Gauhati for direct-chartered cargo flights to Europe, South East Asia, and Middle East.

Transport Sector Planning and Coordination

53. Until the advent of the 8th Plan, transport planning in Bhutan was reasonably straightforward, with investment decisions guided by physical (engineering) plans to establish: (i) a rudimentary arterial grid of north-south and east-west highways with connections to district headquarters; and (ii) a feeder system of trails, suspension bridges, and rural access roads. Minimum engineering standards were employed in the design and construction of these facilities, and cost considerations were not a major factor as these investments were financed mostly by grants from GOI and through Swiss assistance. Air transport was given minimal priority with virtually zero investment in domestic civil aviation. With the preparation of the Road Master Plan (RMP) and the Civil Aviation Master Plan (CAMP), RGOB now has

the strategic tools to guide the development of the transport sector over a longer time horizon (2020), and establish a more rigorous cost-benefit (C-B) framework for transport sector expenditures. As the most obviously needed roads are built and bottlenecks begin to emerge in the transport system (signaling the need for road and bridge widening, higher roadway geometric standards, and improved and shorter road alignments), a systematic economic appraisal of transport projects is needed to permit an adequate judgment about expenditure priorities between transport and other sectors, among transport sub-sectors (modes), and within a sub-sector such as road transport. Transport investments in Bhutan fall in two broad categories: those where investments follow actual and/or predictable transport demand (mostly in established transport corridors), and those where transport investments, whether singly or in concert with investments in other economic and social sectors, are expected to stimulate transport demand. In either case, the key objective of planning is to meet the transport demand, actual or latent, at the lowest cost to society (i.e., the sum of economic, social, and environmental costs). Thus it is essential that a cost-benefit framework be introduced in evaluation of future investment proposals in the transport sector. There is little evidence of economic prioritization in the planning process for the 9th Plan. Regarding transport investments in the 9th Plan and beyond, it appears that there is scope for changing the modal share, with a larger proportion of expenditures directed at domestic aviation and urban transport infrastructure. The following observations are offered regarding the direction and prospects of future public investment in transport.

Roads

54. By the end of the 9th Plan, the primary (arterial) road grid should be in place with some missing/sub-standard links along the Second (Southern) East-West highway, requiring construction of 570 km of new roads and upgrading of 250 km of existing roads. Besides security considerations, the location and justification for a second E-W Highway should take into account the location of future industrial, manufacturing, and commercial enterprises in the border towns in Bhutan. The next phase of road development (already initiated in the 8th Plan) should focus on:

- Expansion of feeder roads (collectors-distributors) to support economic production and provision of social services; and
- Progressive improvement in the capacity, safety, and quality of the primary arterial grid to help reduce travel time.

55. *Feeder roads* should be justified on basis of objective socio-economic criteria, within regionally balanced plan allocations. The need for feeder and rural access roads should be fully integrated in district development plans and prioritized through beneficiary assessments and simple investment rules that maximize economic and social benefits, similar to the rules utilized for prioritizing investments in suspension bridges and mule tracks. Greater coordination is needed between DOR, the departments of agriculture and forestry and local governments, when planning motorized access to areas previously served by foot and mule trails. It would thus be useful to consider a network approach to minimize the cost of providing access to a given area. Given the topography and scattered pattern of settlements, building feeder roads to DOR standard to serve all settlements could become an expensive and unaffordable proposition. The cost of rural access could be minimized by planning DOR-standard feeder roads as 'spines' with lateral extensions in the form of short rural access roads and all-weather motorable tracks, constructed by other RGOB agencies (such as the Departments of Agriculture, Forests, and Education, the local governments) and the communities.

56. *Main roads (national and district roads)*: Construction and improvement should be justified solely on the basis of economic criteria with a systematic incremental economic analysis of improvement alternatives. Minor road improvement works, for example, road widening at curves and short road

realignments (such as those carried out on the East-West Highway during the 8th Plan), yield negligible benefits in travel time savings and do not appear to be economically justified. Besides, such works can result in serious environmental damage and can reduce the margin of safety by allowing higher speeds on short road sections. Road realignment and widening projects should be systematically planned to improve the overall operating environment (improved safety, better sight distance, reduced distance and/or travel time) of a road link and not just short isolated road sections. It is also not obvious if the entire program of realignment, widening, and dualization of national roads included in the 9th Plan has an acceptable economic return, and if some of the proposed works could not be programmed over a longer time horizon to allow for a more thorough investigation of more cost-effective technical alternatives. It also appears that work on the Wangdue-Khotokha Highway to serve a proposed international airport at Khotokha should only begin after an economic justification for the combined airport-highway project has been established and financing secured for the proposed airport. This calls for more effective coordination between roads and civil aviation departments.

Air Transport

57. Despite its potential to shrink distances and reduce internal and external isolation, air transport has not figured prominently in RGOB's priorities in the transport sector. Only about six percent of transport expenditures are allocated for air transport in the 9th Plan. The opening of the East-West Highway reduced the travel time from Samdrup Jongkhar to Thimphu from about 18 days along mule tracks to three days by automobile. Domestic air service could reduce the three-day journey by road to less than an hour. The lack of large urban centers and few suitable sites to locate airports are constraining factors in developing high cost, low volume rapid transport options, but rising personal incomes and education levels, the requirements of the low volume, high price tourism market, and the need to integrate the eastern and central regions with the more developed western region are factors that could support the introduction of domestic air services. RGOB may wish to study Nepal's experience in evolving one of the most advanced institutional models for providing domestic freight and passenger air services to remote mountain locations through small private airlines (six of which offer scheduled domestic air service), regulated by the government. The RGOB's Civil Aviation Master Plan (CAMP), being prepared with Sida (Sweden) assistance, should include a review and assessment of:

- *domestic air transport services including* identification of all potential sites suitable for heliports, airstrips (for short take-off and landing operations), and VFR/IFR runways, and the technical and economic feasibility of introducing private air transport service using small fixed-wing aircraft, initially between Paro and Yonphula with later expansion to other towns with suitable airstrip/runway sites;
- *international air transport services*, including the feasibility of Druk Air operating international passenger and cargo operations from an alternate hub at a nearby Indian or Bangladeshi airport with short haul flight connections to Paro and other potential domestic airports, the possibility of operating scheduled/chartered flights by small fixed-wing aircraft from the nearby all-weather Indian military airports (recently opened to civilian operations)--Gauhati and Bagdogra-- to locations in Bhutan, and allowing private Nepali airlines to offer direct service from nearby Nepali airports such as Biratnagar to Paro and other destinations in Bhutan;
- *a new all-weather international airport* (as an alternative to Paro), with special attention to the economic and financial feasibility of a proposed international airport at Khotokha, with a new 32 km access highway. This alternative would involve a three-hour journey by road to Thimphu over the foggy and snow-swept 3116 m Dochula Pass (almost double the time between Thimphu and Paro Airport) and should be compared with upgrading Paro Airport with state-of-the-art en-route and airport navigation systems. Such a comparison should assess the incremental

improvement in the safety margin against the cost involved in installing and operating such an advanced navigation system; and

- *Druk Air*—its financial and operational performance—and propose a corporate strategy and options (other than the upgrading of its two-aircraft fleet with RGOB support) to make it operationally efficient and financially autonomous. Consideration may be given to partial or full privatization or establishing a partnership with a regional/international airline with code-shared flights and sharing of equipment and terminal services. Druk Air might also consider wet leasing passenger aircraft on a seasonal basis to cater to the peak passenger demand during the tourism season.

Urban Transport

58. Bhutan is urbanizing rapidly with much of the growth concentrated in Thimphu, Phuentsholing, and Paro, primarily due to migration from other parts of Bhutan. At present, only 20 percent of the population lives in urban areas and the largest town, Thimphu has a population of about 50,000. By 2020, over 50 percent of the population will be living in urban areas and Thimphu's population may well cross the 100,000 mark within the next decade. In spite of the emphasis placed on urban planning, Thimphu and other towns have not expanded in a planned and organized manner. Growth on the periphery has taken its own course with mounting evidence of urban sprawl along the river valleys, unplanned densification of settlements with inadequate infrastructure services as commercial activities increase, and uncontrolled strip development along highways. Transport can play a leading role in influencing land use and shaping the future cityscape in a rapidly urbanizing regime. While a more comprehensive discussion of urban transport issues is beyond the scope of this paper, RGOB could consider the following options to secure a more livable and less carbon dependent (greener) urban environment:

- Acquisition and reservation of generous rights of way for future urban transport corridors, which could serve as green spaces until their conversion for transport use as parkways, busways, light rail transit etc;
- provision of pedestrian friendly street layouts and junctions with as much street space (footpaths etc) reserved for pedestrians as vehicles, and only off-street parking facilities for vehicles; and
- given the high cost of imported oil and the potential electricity surplus in a few years, the substitution of electricity for oil as an alternative source of renewable transport energy (with concomitant urban air quality benefits, especially in valley towns) to run electric trolley buses and eventually light rail transit as an alternative to diesel bus transit, and electric or hybrid-electric vehicles as a cleaner alternative to conventional (gasoline/diesel) cars, minibuses, delivery vans, and 2-3 wheelers.

Road Transport Services

59. As indicated by the vehicle registration and traffic levels, transport activity is concentrated in the western region of Bhutan, particularly in Thimphu, Phuentsholing, and Paro. This concentration of transport demand offers possibility over the long run of deregulating passenger transport services in the Thimphu-Paro and Thimphu-Phuentsholing corridors, allowing full competition in these markets without resort to economic regulation of routes, tariffs, and service frequency. The most likely outcome of such a policy would be changes in service choice, quality and cost, with normal passenger bus services supplemented by mini- and micro-buses, market determined fares varying according to demand, an overall improvement in frequency and quality of service and a reduction in average fares. Some of these outcomes are already manifest as a result of the competition offered by taxis on these routes. To ensure

affordability, RSTA could establish indicative passenger tariffs as it does for freight rates. Outside of these two corridors, RSTA should continue its current policy of 'competition for the market' to provide reliable and affordable public transport services. This policy should be extended to urban transport bus services where RSTA, instead of indirectly subsidizing such services, should franchise bus routes to private operators through a competitive process with regulated tariffs and service requirements. From RSTA's standpoint, the main challenge is the determination of fares, which offer operators a chance to survive while protecting the public interest. Affordability of fares must be balanced against the risk of driving operators into bankruptcy. RSTA also retains the responsibility for the provision of infrastructure and facilities for the traveling public and the transport operators. Terminals and arrival/departure sheds planned for construction during the 8th Plan did not materialize due to financial constraints. As an alternative to public provision of these facilities, especially bus terminals, RSTA could consider the alternative of having these facilities constructed and operated under a BOT/concession arrangement, with revenues derived from service fees or rentals from leasing commercial space for restaurants, shops and other amenities in the terminal area. Equipment and training of personnel to enforce road safety, vehicle emissions, and vehicle/axle load regulations are also needed.

Transport Master Plan

60. The Government has considered seeking assistance from ADB and GOI for the preparation of a Transport Master Plan**.** With two Master Plans covering roads and aviation already in hand, the main master planning exercise for transport infrastructure appears to have been completed. Furthermore, good progress has been made in establishing a reasonably well-functioning RSTA. There are, however, several issues that require further study and analysis such as: transport pricing and subsidies, competition and regulation policies, international transit, trade logistics and facilitation, restructuring options (including privatization) for Druk Air and the Mechanical cell of MWHS, private-public partnerships in roads and civil aviation sectors, modernization of road construction and maintenance technology, road vulnerability and hazard mapping, and the feasibility of alternate modes of transport such as ropeways and the use of fixed-wing aircraft using small landing strips. In addition, it is becoming urgent to address the emerging urban transport problem and prepare comprehensive Urban Transport Plans for Thimphu and Phuentsholing. It is recommended that RGOB consider including in the proposed Transport Master Plan a *National Transport Strategy and Policy Review* to identify and analyze emerging transport sector issues, recommend appropriate strategies and policies to address these issues, and articulate an implementation plan for sector modernization, including policy and institutional reforms.

Public Expenditures, Cost Recovery, and Subsidies

61. The transport sector accounted for a ten percent share of total **public expenditures** in the 8th Plan with about 20 percent spent on recurrent expenditures. The 9th Plan aims at a similar allocation for the transport sector. Public expenditures on transport will need to be sustained at this level or higher to achieve the transport sector targets envisaged in Vision 2020. The allocations for domestic civil aviation are low in terms of achieving broad-based accessibility objectives and a more balanced transportation system. Maintenance has been given adequate priority in funding. There are no major imbalances in various categories of road expenditures, although there has been a significant shortfall in pavement resurfacing with implications for the continued serviceability of the paved road network. Improvements can be made in the planning and application of public expenditures to ensure value for money, in the light of the following observations:

- Nearly 50 percent of transport expenditures in the 8th Plan period were spent on programs not included in the Plan but taken up on need basis. Such a large deviation indicates poor programming, weak implementation readiness, and/or funding uncertainties. This would suggest

better prioritization and more rigorous programming of annual expenditures, based on a multi-year rolling program.

- There was a financing gap of Nu 3.0 billion (45 percent) for road expenditures at the start of the 9th Plan. Expenditure of an additional Nu 1.7 billion was envisaged for realignment/widening projects with Project DANTAK assistance, outside the projected 9th Plan outlays. Core expenditures to maintain and rehabilitate existing roads should take priority over new roads construction. Routine maintenance should continue to have the first claim on RGOB's domestic resources (revenue budget) for road expenditures.

- Repair of Monsoon damage is an inevitable and major part of road maintenance operations but the amount of monsoon restoration works varies from year to year (between Nu 28 and Nu 175 million annually during the period 1996/97 to 2000/01), depending on rainfall intensity and between different roads and maintenance districts. DOR does not receive an annual allocation for monsoon restoration. Instead it must make a request for funding on a needs basis, which is met by MOF from a contingency fund after joint verification by MOF and DOR, initially at the end of the monsoon season. This method of funding does not allow DOR to undertake the full range of preventive (e.g., slope stability and drainage improvements) or replacement (minor realignment) works in a systematic and timely manner; nor does it provide a basis for assessing the cost-effectiveness of such emergency expenditures. This activity should be accounted for in the DOR budget in the same way as routine and resurfacing operations. Provision for monsoon repairs (estimated at Nu 350 million for the 9th Plan period) should also be more realistically and formally established in the budget, so that resurfacing is not treated as a residual item when monsoons are more severe than expected.

- Despite generous RGOB funding for routine maintenance, it is not obvious if full value for money is obtained from these expenditures. Routine maintenance, even when it is done well, only guarantees that roads remain passable; it does not improve network serviceability or quality of service. Owing to the relatively low quality of initial construction, the harsh operating environment, and the very large periodic maintenance/resurfacing backlog, the functional serviceability of the road network (in terms of pavement roughness) is very low. The average service life of pavements is short despite low traffic volumes—new overlays are needed within three-five years compared to five-eight years in other comparable environments. There is clearly scope to improve the cost-effectiveness (quality and productivity) of road expenditures.

62. Taking into account all identifiable direct and indirect transport **user charges and taxes**, the revenue from the transport sector represents less than 20 percent of transport sector expenditures. According to the Road Master Plan (RMP), total estimated revenue from road users was about Nu 200 million in 2000/01; what may be properly considered as road user charges (motor vehicle registration fees and sales tax on petroleum products) contributed about Nu 73 million, a little more than ten percent of the amount required to maintain the country's roads and bridges during that year. It is likely that airport fees and aircraft landing charges do not fully cover the expenditures on civil aviation infrastructure. While there may be limited scope for the introduction of transport user charges in Bhutan, it is important that consideration be given to the introduction of this concept where feasible. As indicated in RMP, road user charges could fully finance some recurrent costs (routine maintenance and operation), while making a part contribution to others, such as periodic maintenance (resurfacing), monsoon repairs, and replacement of equipment and plant. As a first step, consideration may be given to:

- A fuel surcharge: for example, a surcharge of Nu 5 per liter of diesel and gasoline would have generated revenues of Nu 170 million in 2001/02 to cover DOR's routine maintenance plus the estimated monsoon restoration expenditures in that year. Imposition of such a large fuel levy, however, may not be currently feasible in the Bhutanese context because of implications for

transport tariffs. Alternatively, the excise duties refunded by GOI on imported diesel and gasoline used by the transport sector could be earmarked to finance road maintenance expenditures. As a minimum, price parity should be maintained with Indian fuel prices to avoid distortions in the Bhutanese market, including cross-border smuggling.

- Tolls on: (i) substantially shorter realigned sections (20-40 km length) on national roads to bypass existing narrow and winding sections with steep gradients and unstable slopes, (ii) bridges improved and widened to reduce time delays and improve safety; and (iii) the Tashichhodzong-Bebesa Expressway. Such road/bridge tolls are theoretically equivalent to congestion tolls. Revenues from tolls could partially support competitively-bid Build-Operate-Transfer (BOT)) schemes for roads, bridges, and tunnels, even if this might imply contracting out negative concessions to the private sector to build and operate road infrastructure in order to increase the efficiency of public expenditures.

63. Despite the low level of cost recovery in the transport sector, transport users benefit from both direct and indirect government **subsidies**; salient among these are:

- Druk Air had an estimated net loss (after depreciation) of about Nu 57 million in 2002, indirectly borne by RGOB. With 62 million revenue passenger-km. in 2002, this loss translates into an indirect economic subsidy of Nu 0.92 per revenue passenger-km. The beneficiaries of this subsidy are mostly foreign tourists and the better-off Bhutanese who can afford international air travel. This indirect subsidy could be reduced or eliminated by increasing the cost efficiency of Druk operations, beginning with the introduction of more efficient aircraft, improving load factors, reducing operational overhead, and increasing air fares as a last resort. To reduce the impact on tourism, reducing visa fees or the mandatory royalty payment per tourist per night could offset a possible increase in fares.
- Urban bus service operated by Bhutan Post in Thimphu; all capital costs and half of the operating costs are directly subsidized by RGOB As fares cover about half of the Nu 3 million operating cost of ten buses, the implicit annual operating subsidy was approximately Nu 150,000 per bus in 2002. Although the users of this service include school children, the beneficiaries are the generally better off urban households in the capital city. There is no economic or environmental rationale for subsidizing urban transport services in Thimphu or other towns in Bhutan. If transport subsidies must be provided to school children, there are more efficient ways of administering such a targeted subsidy, such as through vouchers based on a family income test.
- An interest subsidy is provided by RSTA to competitively selected bus operators for purchase of about 20 buses to provide services on unprofitable rural routes. This is a good example of a targeted subsidy based on the principles of competition for the market. A similar approach should be used for subsiding urban bus services if ever a case could be made for such subsidies in urban centers.

64. It would be best if RGOB articulates a coherent and transparent cost recovery and subsidy policy in the transport sector, before transport subsidies become enshrined as public entitlements as an integral part of the national transport policy. The transport operations of Bhutan Post also need a more detailed review to ensure that there are no hidden cross-subsidies and if there are any subsidies, they should be made transparent and justified on social or economic grounds.

Road Technology, Labor Productivity, and Environmental Management

Road Technology

65. Road building in Bhutan for the most part follows archaic practices of a bygone era (circa mid-20th Century), imported to Bhutan by Project DANTAK. Road construction and maintenance are characterized by labor intensive, low productivity, and high cost practices that result in poor quality roads with very high roughness, poor serviceability and short service life. The RMP provides a comprehensive review of these practices and provides recommendations for modernizing road technology in the Bhutanese context. The key recommendations are discussed below:

- A majority of road construction and maintenance problems arise from poor route location decisions, often dictated by social and political considerations, and zigzag alignments to minimize structures and stream crossings. Inadequate attention to drainage and slope stability in road design and construction is the most common reason for premature road failure. Building on DOR's recent experience with IDA (Rural Access Project) and ADB supported projects, all new roads (irrespective of classification) and major realignments of existing roads should be preceded by a detailed investigation of alternative alignments using the methods and tools (aerial photography, satellite imagery, and GIS-based landslide susceptibility, risk, and hazard mapping), developed under the DfID-financed pilot project on 'Landslide Risk Assessment for the Rural Access Sector' in Bhutan and Nepal. DOR should further strengthen its institutional capacity in modern road design technology, building on the experience it has acquired since the early 1990's in the use of computer software (e.g., the Australian software, GEOCOM) for geometric design of roads. However, excessive reliance on computerized terrain models for road alignment and cross-section work must be avoided as these models are no substitute for detailed field surveys and engineering judgment by experienced road designers. This should be accompanied by improvements in construction methods, including bioengineering applications, to minimize slope failures and drainage problems.
- Regarding pavement construction and resurfacing, the major problem areas pertain to poor grading and laying of unbound aggregate mixtures, inadequate compaction of subgrade and pavement layers, and use of a thin layer (20-30 mm) of pre-mix carpet (PMC) in which aggregate and bitumen are literally 'cooked' by the roadside using fuel wood, then mixed and laid by hand, and finally rolled with a conventional three-wheel steel drum roller, often after the premix has cooled (see Annex D). The result is a poorly compacted, uneven and rough pavement that begins to show signs of distress within four-five years and disintegrates within five-eight years, even under low traffic loads. Although several attempts have been made under ADB-financed projects to introduce mechanized paving in the form of surface dressings and machine-laid asphalt, Project DANTAK continues to use PMC as the sole means of resurfacing, while the paving/resurfacing contracts awarded by DOR are not sufficiently large for contractors to mobilize the necessary equipment for mechanized paving. Poor compaction of bituminous surfacing is more a result of inadequate works supervision and quality control than lack of appropriate compaction equipment. DOR would be well advised to immediately substitute surface dressings and other low-cost bituminous surfacing as the preferred paving alternative to PMC. This will help to reduce cost (about 1 km/day of resurfacing can be achieved with mechanized surface dressings while only 250-300m/day of pre-mix carpet can be laid manually), allow more efficient use of imported bitumen, and also improve pavement ride quality and serviceability. Proper and effective compaction (with systematic field tests) of subgrade and base course layers is essential to ensure good quality pavement construction; however, substitution of penetration macadam bases by well-graded crushed stone bases is a pre-condition for ensuring good field compaction.

- The most common routine maintenance operation in respect of bituminous pavements is patching of cracked and potholed areas. Traditional practice is to make the bituminous patching mix in small batches by heating bitumen with aggregate over a wood fire by the roadside. This results in a poor quality product and is environmentally unfriendly as trees are cut to provide firewood. This practice should be replaced by the use of premixed bituminous material with either hot or cold mix asphalt. The scale of operations in Bhutan would indicate the use of cold mix made by mixing crushed stone with a bituminous emulsion in a concrete mixer. The cold mix can be used for patching for up to several days and can be transported on a small truck. This operation would require some equipment—a concrete mixer, a truck, and tamper, and a small portable roller. Other routine maintenance operations like cleaning side drains and clearing small slips require common labor but clearance of large slips and repair of structures and drains require skilled labor, equipment, and material transport. Gravel and earth roads require periodic grading and rolling to ensure a good riding quality. There is little knowledge or experience with these mechanized maintenance operations in Bhutan but a reasonable level of serviceability can be assured by maintaining the road profile, filling potholes, and cleaning and repairing drains by manual methods using hand tools.
- Improved quality assurance will require a significant modernization and strengthening of the field operations of the Standards and Quality Authority. The regional materials and soil testing facilities should be upgraded and supplemented by mobile testing units (on wheels) to ensure compliance with construction specifications. In addition, DOR may consider seeking short-term advisory technical assistance from ILO, TRL (UK), JICA, or other bilateral donors to help introduce modern road construction and maintenance technology.

Labor Productivity

66. One of the impediments to the modernization of road construction and maintenance in Bhutan is DOR's large labor force. The problem is compounded by a contracting industry with limited experience in mechanized road works. But given the labor shortage in Bhutan as well as its relatively high cost, DOR and its contractors have little choice but to mechanize road operations in order to contain costs and improve the efficiency of road expenditures. The other alternative would be to increase dependence on imported labor from the neighboring countries. The main issues are how to gradually modernize construction and maintenance methods and how to gradually shift from force account to contract works. A switch to mechanized methods requires more than procurement of the necessary equipment; it requires a skilled labor force capable of operating and maintaining the equipment and supervisory staff who can make the most efficient use of the equipment. DOR employs a labor force of over 4600 to maintain a 2100 km road network under its direct charge. This averages over two employees per road kilometer, an excessively high labor deployment by any standard. At a wage rate (including benefits) of $3-4 per day for the NWF employees, there is little economic rationale for the labor-intensive road construction and maintenance methods used by DOR. By a judicious substitution of labor by equipment, DOR and its contractors could increase labor productivity by a large margin while reducing the cost of road works. These measures could include, for example, retraining and deployment of NWF staff to undertake bioengineering works that are highly labor intensive but require skilled supervision. Other possibilities include setting up mobile stone crusher units and cold bituminous mix plants at the permanent campsites, instead of transporting labor to temporary roadside locations to break stones and prepare and lay PMC by hand. Furthermore, the younger NWF staff could be provided vocational training to meet the demand for equipment operators, mechanics, and skilled labor in other construction trades.

Environmental Management

67. The Environmental Assessment Act of 2000 establishes the legal framework for environmental clearance of road projects of all types. Under the National Environmental Guidelines (supplemented by sectoral guidelines on roads and highways), all new road projects of any classification must have a full Environmental Assessment before the National Environment Commission can grant its approval. These guidelines, supported by the Environmental Code of Practice developed by DOR cover all stages of road projects from design through construction to operation, and apply not just to roads under DOR, but equally to roads under the jurisdiction of other agencies (such as departments of agriculture, forestry, power, Dzongkhags, and Geogs). The DOR with technical assistance under the ongoing IDA-funded project (and support from Netherlands) introduced the so-called Environmentally Friendly Road Construction (EFRC) methodology for all its new road construction. Other agencies are also expected to adopt EFRC methodology in their road building programs. Initial investment costs using EFRC increases by 25-30 percent higher as compared to the traditional approach, but EFRC is likely to be more economic on a life cycle cost basis due to lower routine maintenance and recurrent costs. While there is genuine enthusiasm in DOR/MWHS for application of EFRC to minimize environmental damage resulting from road development, and DOR has started adopting EFRC techniques in its road construction programs, its application is still in an embryonic stage (see Annex D). Little or no attention has been paid by DOR to the use of these techniques in road improvement works (e.g., on the East-West Highway) and monsoon restoration works. There is a lack of experienced support and practical guidance to foster the application of EFRC by contractors and site engineers. Some immediate actions that DOR could consider to enhance the environmental quality of its road works are:

- Reassessment of road improvements consisting of minor realignments, since the cumulative negative environmental impacts of these improvements outweigh the benefits in travel time savings (mostly negligible) and reduced accidents (mostly undocumented). Such realignments are best undertaken as part of a comprehensive program to remove road safety hazards (black spots) or a systematic program of road widening.
- Rapid substitution of PMC by other more appropriate bituminous surfacing (such as surface dressing), as the current practice of roadside 'cooking' of bitumen and aggregate using firewood results in highly toxic smoke emissions that are injurious to human health, especially where female workers bring their lactating babies to the work site. Furthermore trees are felled to provide fuel wood. Beyond the environmental benefits, the higher productivity obtained from the use of mechanized surface dressing will go a long way in removing the backlog of resurfacing work.
- Use of appropriate equipment in road construction and restoration works: for example, substitution of crawler tractors by **appropriately sized** hydraulic excavators[2] for earthworks (especially on steep slopes and other sensitive locations) as crawler tractors are not always restricted to specified terrain conditions; use of wheel loaders instead of crawler tractors with angle dozers to clear slips; and use of mini-pavers and cold pavement recycling equipment for bituminous paving and resurfacing.
- More aggressive application of bioengineering methods to stabilize slopes above and below the road formation; appropriate design of side and cross drainage with sub-drains to minimize erosion; full surface dressing of pavement shoulders, starting from the edge of masonry side

[2] The excavators currently in use in feeder road construction are over-sized and over-powered, and cannot be used effectively on narrow mountain roads to minimize excessive cutting and excavation. Hence this gives rise to excessive amount of spill material.

drains; and 'daylighting' of the base course across the shoulders (abandonment of 'trench construction' with stone edging to contain the macadam base).

- Use of modern rock blasting techniques (pre-splitting and controlled charge) to obtain clean rock faces and to optimize the size and amount of rock excavation.
- Extension of EFRC methods and technologies to maintenance, monsoon restoration, rehabilitation, and improvement (widening) works.

68. In the medium term, consideration could be given to the use of concrete pavements as an alternative to bituminous pavements. On a life-cycle basis, concrete pavements may well be a more attractive economic and environmental alternative for Bhutan's climatic and soil conditions. With surplus electricity (as a power source for the domestic cement industry), Bhutan could reduce its dependence on imported bitumen while reducing green house gas (GHG) emissions. Concrete block pavements offer an attractive alternative for paving urban streets while roller compacted concrete or concrete blocks could be effectively used on rural roads with steep gradients in mountainous terrain. These pavement technologies can be adapted to utilize a significant amount of semi-skilled labor.

69. Except for strip development along national highways, road building in Bhutan has resulted in few induced or irreversible impacts on natural habitats, biodiversity resources, and other environmental and cultural assets. The forest cover is currently estimated at over 70 percent of the land area and it is Government policy to retain a minimum forest cover of 60 percent. Despite this favorable record, it would be useful if DOR/MWHS invest in the preparation of a GIS-based inventory of ecological and cultural assets that might be vulnerable to future road construction and improvement programs. This task could be undertaken as a complement to the ongoing landslide hazard-mapping project.

70. The rapid growth of the urban vehicle fleet and the concomitant increase in traffic is contributing to occasional episodes of poor air quality in Thimphu Valley. The problem could get worse given the physiographic location of Thimphu Valley, physical limitations on expanding the urban road network, an embryonic public transport system, and the rapid increase in urbanization. RSTA has initiated a basic vehicle emissions testing program. Gradual tightening of emissions standards, with effective enforcement through a robust vehicle inspection and maintenance (I/M) program, including spot roadside inspections, should help to maintain vehicular emissions within manageable limits.

Sector Management and Institutional Strengthening

71. The Government policy in all sectors, including transport, is to concentrate on policy, planning and regulation, leaving operations to the private sector. RGOB is in the process of redefining its role from that of 'provider' to 'enabler' of transport infrastructure and services. The staff complement of transport agencies was considerably reduced, although they still rely on a very large labor force for force account construction and maintenance works. Nevertheless, DOR has contracted an increasing amount of road construction and maintenance work to private contractors as their capacity and capability has grown. Between the 7th and 8th Plan periods, there was a ten-fold increase in the nominal value of road works executed by private contractors. The contracted works represented about 34 percent of total expenditures by DOR during the 8th Plan, with 65 percent of road construction and 47 percent of monsoon restoration works carried out by private contractors. The consulting profession should be encouraged and supported to undertake survey and design and project oversight work under tight DOR supervision. DOR should aim to contract most road construction and resurfacing and a significant portion of maintenance to the private contracting industry. In this context, it is important that RGOB facilitate the entry of foreign firms in the contracting and consulting businesses beyond the joint ventures that have been in practice since 1998.

72. Until the mid-1990s, road construction and maintenance was mainly carried out by DANTAK, a division of the Indian Border Roads Organization of the Indian Army, under grant financing from GOI. Aside from the use of local laborers, there was a very limited role for RGOB staff, local engineers and contractors in road planning, construction, and management. It was only during the last decade that DOR and local contractors started to develop these capabilities under projects supported by IDA, ADB, and bilateral donors. It will take some time and continuity of effort to fully transfer modern transport (including road construction) technology and management practices to Bhutanese institutions. Meanwhile, a fairly large human resource gap hinders the development of the transport sector at most levels. Effective sector management is constrained by the weak capacity of both public and private sector transport agencies, especially at the mid career level. As part of the RGOB's decentralization policy, some road development and maintenance funds have been channeled directly to Dzonkhag and Geog levels, but the local authorities lack the organizational capacity and technical manpower to plan and implement such works.

73. The achievement of transport outcomes articulated in *Bhutan 2020* will largely depend on the capacity and reform orientation of transport sector institutions. RGOB has started to strengthen institutional capacity in the transport sector but much yet remains to be done. A Road Safety and Transport Authority were set up in 1997 to regulate transport sector services. A dedicated traffic police to help enforce traffic regulations supports the authority's mandate. Provision of transport services are largely privatized and reasonably regulated in a corruption-free environment. The Policy and Planning Division (PPD) Unit of MOC appeared to be fully cognizant of modern transport management practices, as reflected in the emerging policy to contract out the maintenance of the main roads and use community-based arrangements for the maintenance of feeder and rural access roads. There is a strong inclination within DOR to institutionalize practices that minimize the environmental damage resulting from road works. RGOB is considering a variety of measures to modernize and strengthen its transport sector institutions; some of the key issues are discussed in the following sections.

Sector Reorganization

74. Until June 2003, the Ministry of Communications (MOC) had overall responsibility for all transport sector functions (see Annex C1). Given the wide span of its functions and responsibilities, MOC was bifurcated into two successor ministries, the Ministry of Works and Human Settlement (MWHS) and the Ministry of Information and Communications (MOIC). **MWHS (**see Annex C2) now includes the Department of Roads, the Department of Urban Development and Housing, the Construction Development Board, a new Standards and Quality Control Authority, a new National Housing Development Agency, and a corporate Mechanical Cell. **MOIC** (see Annex C3) has under its purview the Department of Civil Aviation and the Road Safety and Transport Authority, and continues to retain oversight responsibilities for Druk Air and Bhutan Post. The main advantage of this reorganization is the creation of a streamlined organizational structure for management of civil works, especially public roads, housing, and urban infrastructure. But the new organizational structure has its limitations with respect to transport sector coordination and a broad-based approach to accessibility planning. There are significant synergies to be gained by keeping transport (roads, aviation, and urban transport), telecommunications, and information technology under one ministerial umbrella. The problem of the large span of functions and responsibilities could have been addressed by having a lean ministry with a strong planning, monitoring, and evaluation capacity under an expanded PPD, and functional responsibilities delegated to specialized agencies (e.g., a roads authority, a civil aviation authority, and a housing and urban development authority), as in India and Pakistan. Irrespective of how the various organizational boxes are arranged, the objective should be to create a lean and efficient administration. For the future, the management of public roads and civil aviation could be entrusted to public authorities or corporations; RSTA could very well evolve into an autonomous regulatory body covering all transport,

telecommunication and IT services; and semi-autonomous public corporations (such as Druk air, Bhutan Post, Bhutan Telecom, Bhutan Broadcasting Service, and the proposed Druk Machinery Corporation (the envisaged successor to MWHS's Mechanical Cell) could be partially or wholly privatized.

Enabling Legislation

75. Modern legislation has been introduced to provide a sound legal basis for the development and operation of the transport sector. The Road Transport and Safety Act covers traffic safety rules as well as rules regarding public transport. The Bhutan Municipal Act of 1999 gives municipal corporations specific functions, including the construction and maintenance of roads in their area of jurisdiction, in consultation with DOR. Finally, a draft Road Act has been prepared as part of the Road Master Plan study. Early legislative action on the draft Road Act is needed to clearly establish the functions and responsibilities of DOR, the municipalities, the Dzongkhag and Geog administrations, and other government departments involved in the provision and operation of public roads. This legislation would also facilitate private sector participation in the road sector, help establish a stable road funding system (RGOB might consider a Road Fund in the future), and allow implementation of actions to prevent encroachment on public rights of way and damage to road infrastructure. To complete the legal underpinnings of the transport sector, additional legislation is needed in the areas of civil aviation (pertaining to organization, financing, and operations) and transport facilitation and logistics (pertaining to carriage of goods by road, air, and multimodal transport, including inland container depots/terminals).

Role of Private Sector

76. It is highly unlikely that RGOB will be able to implement its ambitious transport development program without a significant expansion and strengthening of the private sector role. As mentioned before, RGOB for the most part has withdrawn from direct provision of road transport services and this policy should be extended to urban and air transport services. Likewise, DOR and other RGOB agencies should limit force account road works and rely on the contracting industry and community-based organizations. The construction industry should be provided technical assistance through the Contractors Development Board to improve its financial and technical capacity. In the transition from force account work to contracting, as the domestic contractors build up their capacity, it might become necessary to use foreign contractors, at least for major road construction and rehabilitation jobs. To speed up technology transfer, domestic contractors should be encouraged to associate themselves with foreign contractors in joint ventures or as subcontractors. The contracting of maintenance and preventive work (to help reduce monsoon repairs) is likely to be more difficult than that of new construction and rehabilitation. For one thing, it will require assurances of continuity of resources and multi-year contracts to enable contractors to get the proper equipment. There could be social problems in dealing with the large unskilled work force presently engaged in low-tech routine maintenance operations. And management and supervision of the contractors by RGOB agencies will have to be significantly improved to control costs and ensure quality. The consulting profession is still in its infancy in Bhutan and RGOB should create a more favorable environment for foreign consulting firms (especially in partnership with domestic firms) to operate in Bhutan. A program of technical assistance to the construction industry and the consulting profession could be very beneficial, in particular during the first years of increased maintenance work by contract. Contract maintenance pilots are being implemented under the ongoing IDA and ADB projects. A maintenance advisor, financed by the Netherlands for three years, should help to address some of the foregoing concerns. DOR should also strengthen its in-house capacity to effectively manage and supervise the work of private sector consulting firms.

National Work Force

77. The future disposition of the nearly 4000-strong National Work Force could hinder the mechanization of road construction and maintenance operations, while constraining increased private sector participation in road works. NWF is essentially an entitlement-driven social welfare organization with benefits and perks not commonly available to the general labor force. Restructuring NWF and identifying new roles for an essentially unskilled work force is going to pose a formidable institutional challenge. The first step should be the introduction of a voluntary retirement scheme to reduce NWF's size. A possible restructuring option could include the creation of self-accounting micro enterprises working out of the current maintenance camps and competing for small annual routine maintenance contracts with minimum guaranteed work for a specified number of years. Other options could include reorienting the activities of the work force to labor intensive environmental protection/mitigation works and vocational retraining programs, especially in construction technologies (as masons, concrete technologists, work inspectors, etc).

Asset Management

78. Various attempts have been made to develop a road management system to determine priorities for routine and periodic maintenance. Software was acquired in the framework of foreign financed projects, but staff was not trained sufficiently and the systems were abandoned. Under the RMP, DOR recently acquired another road model "dTIMS", but again its development has not progressed for lack of trained personnel. The RMP study provides recommendations for establishing a comprehensive asset management system in DOR, comprising several modules—a highway information system, an HDM-4 based strategic planning model, and maintenance, pavement, and bridge management systems. For a small road system like Bhutan's, it should be possible to combine these elements into a simple and user-friendly GIS-based road and bridge inventory with a condition assessment (using both visual and test-based parameters, such as roughness), and an appropriate decision-making model like HDM-4. DOR is fully aware that such an asset management system would also be useful for monitoring and evaluating road development programs. The immediate need, however, is to conduct regular and systematic traffic counts and road condition surveys to give planners and engineers a sound and objective basis for feasibility studies and for planning maintenance and rehabilitation operations. RSTA should be encouraged to implement a computerized national registry of vehicles and motor vehicle operators. Such a registry would help in expediting the issuance of vehicle and driver licenses, improve the collection efficiency of taxes and fees, and could also be useful in law enforcement work.

Human Resource Development

79. Successful outcomes in the transport sector will largely depend on the ability of MWHS and MOIC and their technical units to effectively plan and manage the ambitious sector investment program. There is an urgent need to strengthen the planning (including M&E) capacity at all levels, especially in PPD, DOR, and the Dzongkhags. The shortage of planners and economists at the PPD level (in former MOC) is particularly acute. RSTA likewise should be reinforced with regulatory expertise and skills, with at least one economist with knowledge and experience of tariff setting and transport regulations. Following the restructuring of MOC, RGOB should now develop a comprehensive human resource development program for the successor ministries/agencies, which should identify the skills gaps in the light of new mandates and responsibilities, review available training resources and recommend appropriate training strategies and programs (domestic and international), and propose policy actions to recruit and retain staff with the necessary experience and skills.

80. DOR with a staff complement of about 640 (240 professional; 400 support) is the largest Government agency in the transport sector, and if the NWF personnel are included as part of the DOR

establishment, then DOR is arguably one of the largest public employers in Bhutan. DOR would not be able to support this level of staffing if the future role of DOR is to plan road works and supervise and facilitate their implementation by the private sector. Moreover the skills endowment of the current DOR staff may not match future requirements. Even now, DOR lacks skills and expertise in critical areas. For example, it has no geotechnical engineers on its staff to manage slope stability problems and monsoon repair works. Neither does it have a sufficient number of qualified works inspectors to inspect and certify the work done by contractors. With the separation of the Mechanical Division, DOR's staffing should reduce by about 50 percent. This will provide DOR the opportunity to reassess its functions and staffing needs in the light of its new mandates and to start a process of renewal and change that could eventually transform DOR into a Road Authority.

81. There is a need to assure better coordination between Department of Roads (DOR) and the Department of Agriculture (DOA), which is responsible for construction of rural roads, so that the road network develops in a balanced manner and maximizes service delivery, especially to remote and isolated areas. RGOB's decentralization policy aims to transfer responsibility for rural roads construction and maintenance to Dzonkhag administrations. It will take time to develop the required institutional and technical capacity at Dzonkhag level; even DOA does not have the full complement of technical skills and experience to manage a national rural roads program. RGOB should put in place coordination mechanisms to allow transfer of experience and skills from DOR to DOA in the first instance and then to the Dzonkhags. Thus, DOR must not lose sight of its critical role in establishing and strengthening the technical capacity of the Dzongkhag administrations. This may require the creation of a regional headquarter to serve the road needs of the central and eastern regions, while the western region would continue to be administered from Thimphu. In this context, the role of DOR's field-based Executive Engineers requires a reassessment. Special project units established to implement donor-financed projects (e.g. Bank, ADB, others) have affected the functions of the Executive Engineers in the eight divisional offices. While the executive engineers are, in principle, responsible for all works carried out in their divisions, donor- financed projects are centrally managed and executed with little or no direct involvement of divisional engineers and their staff.

Technical Annex

Bhutan
Transport Sector Note[3]

I. Introduction

High transport costs are impeding Bhutan's economic and social development. Transport sector constraints are identified as one of the key determinants of poverty in Bhutan. The Bank has so far had limited but targeted involvement in Bhutan's transport sector through a rural access road project. Starting in 2003, RGOB embarked on its 9th Five-Year Plan. RGOB is allocating a large part of this planned expenditure to investments in transport and related infrastructure development. This technical annex provides a detailed description of the transport sector, with basic information and data as of end-2002. To the extent possible, relevant data and information have been updated in the main text.

Bhutan's Country Context

Bhutan is a small landlocked Himalayan country with less than a million people and the third highest GDP per capita (US$640) in the South Asia Region—behind Maldives and Sri Lanka. Bhutan has a strong, stable, and inclusive government with a clear vision for development that highlights: human development; culture and heritage; balanced and equitable development; and environmentally sustainable development.

Bhutan's transport sector comprises road and air transport. There are approximately 3,750 km of roads, 4,300 km of mule tracks, 242 motorable and 336 pedestrian suspension bridges, and one airport with a paved runway (that also with visual and no instrument landing system). Air services from Paro (Druk Air) using two BAe-146-100 aircrafts link Bhutan with Bangkok, Delhi, Dhaka, Kathmandu, Kolkata, and Yangon. About 120 or so passenger buses/trucks managed by 38 operators are operating under a ten year contract—public transport operators are tax exempt and those operating non-profitable routes are provided a subsidy by RGOB. There is one major ropeway (7 km long) in Tashila, east of Wangdue, built in 1980-83, primarily to haul timber down and partially services villages in the area.

Transport, communications, trade and commerce contributed 16 percent[4] to the overall GDP at the end of the 8th Five Year Plan (1997-2001); refer to Table 2 for details. Half the country's population lives more than half a day's walk from the nearest motorable road. Other than the traditional surface border crossings with China and India, there is only one airport providing limited air access to the rest of the world.

Transportation[5] poses a considerable cost disadvantage to undertaking many business activities[6]—road transport is slow and regularly disrupted by landslides in monsoons and air transport is erratic and costly. Costly transport is a major factor that is constraining the growth of agro-processing, wood-based, and tourism industries.

In addition to the obvious constraints of a small sparsely populated landlocked Himalayan LDC sandwiched between two goliaths—India and China, some specific transport sector issues are as follows. There is a dire need for improving the road-based access but the high cost of building, maintaining, and

[3] This technical annex was prepared by Jacques Yenny (Transport Consultant) and Amer Durrani (Task Team Leader).
[4] National Accounts, CSO, RGOB
[5] Especially in the more remote central and northern parts of the country.
[6] Bhutan Private Sector Survey, June 14, 2002, The World Bank.

operating roads in fragile ecology/geology, coupled with extremely low traffic volumes poses a development dilemma. Transport on the existing network is slow and fraught with the likelihood of delays and breaks. While ropeways are utilized they are not considered as a large-scale option in goods transport. Trucking costs are high in comparison with the region even after normalizing them for the steep gradients and poor road conditions. Transit warehousing is lacking. There is sole reliance on Calcutta Port and a concentration on Phuentsholing transit corridor—though the Bhutan-Bangladesh inland waterway transit corridor has been explored. Air cargo services are poor. There are no large-scale storage facilities for petroleum and associated products.

Table 1: Bhutan and its Transport Sector

Area, sq. km	46,500
Land boundary, km: (shared border)	1,075: China (470 km) and India (605 km)
Population (Urban/Rural, percent)	760,000 (21/79)
Administrative Units	20 districts and 201 blocks
GDP per capita (2001)[7]	US$632.6
Human Development Index	0.55
Major Industries (percent share)	Agriculture, Hydropower, Cement, Calcium Carbide,
Major Exports (percent share of total exports)	Hydropower (42 percent in 2000/01),
Total Registered Vehicles	22,494
Estimated total vehicle fleet[8]	22,494 (light vehicles 46 percent; trucks and buses 18 percent; two wheelers 36 percent)
Roads, km (Paved/Unpaved, percent)	3,746 (42/58) (also see Annex B for details)
Mule tracks, km	4,300 approx.
Bridges	242 motorable and 366 suspension
Average travel speeds on roads, km/hr	24-32
Airports	1 international/paved r-way
Druk Air PAX-km per year	61.5 million
Imports/Exports, US$/year	US$215 million/US$112 million (2000/01)
Percent of forest area	72.5
Percent of agriculture area	7.7
Percent of pasture are	3.9

Links with outside markets have been extremely limited in the past due to a concentration of trading relations with India[9]. Bhutan's trade partners have diversified over the last ten years. Bhutan's poor investment climate (including limited infrastructure) has discouraged inflows of FDI into the country. The Government is currently establishing the FDI Act and is working to create a more favorable investment climate so that the country can receive higher FDI inflows.

[7] IMF data (2002).
[8] Draft Final Report of the Roads Planning and Management Strengthening Project, 2002.
[9] Most of these being inter-governmental deals for export of electricity.

Table 2: Gross Domestic Product at factor cost by kind of activity in 1980 prices

	Sectors	1980	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	Agriculture, livestock, forestry and fishing	621.4	992.8	1024.6	1004.0	1040.2	1081.2	1124.2	1197.5	1245.0	1279.8	1348.2	1411.2
1.1	Agriculture	309.9	530.9	544.8	555.6	563.9	578.7	585.1	601.0	625.3	646.8	678.5	711.5
1.2	Livestock	139.2	212.0	229.4	201.6	226.1	227.6	243.0	256.0	259.7	263.0	279.7	289.7
1.3	Forestry and logging	172.3	249.9	250.4	246.8	250.2	274.9	296.1	340.0	360.0	370.0	390.0	410.0
1.4	Fishing	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg
2	Mining and quarrying	6.8	19.3	27.4	23.5	26.2	32.7	34.8	46.2	43.7	50.8	56.2	47.9
3	Manufacturing	35.8	158.1	186.7	208.8	218.9	233.0	269.7	291.5	292.0	297.9	308.9	292.6
4	Electricity, gas and water	2.5	204.1	200.4	210.0	232.0	258.8	325.0	342.6	353.6	367.2	400.6	398.2
5	Construction	88.5	136.8	116.2	168.5	178.0	221.5	243.0	243.1	266.5	322.3	393.2	466.7
6	Wholesale, retail trade, restaurants and hotels	121.5	134.7	145.1	160.7	163.8	170.2	178.0	203.1	218.2	224.5	231.8	245.1
7	Transport, storage and communications	47.9	172.1	182.0	192.3	234.6	241.5	245.4	271.0	308.9	350.1	381.6	400.2
8	Financing, insurance and real estate	70.2	212.2	208.8	215.4	238.1	245.4	263.2	256.2	319.9	349.1	339.0	419.8
9	Community, social and personal services (govt.)	120.4	223.3	233.2	251.6	266.5	293.0	330.2	334.5	360.5	362.9	401.7	411.9
10	Less: Imputed bank service charges	(20.0)	(28.8)	(21.0)	(28.1)	(45.0)	(61.2)	(95.4)	(115.8)	(106.0)	(90.3)	(87.8)	(104.1)
	Gross Domestic Product	1095.0	2224.6	2303.4	2406.7	2553.3	2716.1	2918.1	3069.9	3302.3	3514.3	3773.4	3989.5
	Growth of GDP	-	-	3.5%	4.5%	6.1%	6.4%	7.4%	5.2%	7.6%	6.4%	7.4%	5.7%

II. The Transport Sector

Roads and Road Transport Services

Roads

Road transport is the only internal transport mode in Bhutan, besides a few ropeways. There are no domestic flights, no railways, and no navigable rivers. The road network [10] totaled about 3,750 km in 2002. This gives a road density of 0.1km/sqkm and 5km/1000 inhabitants (assuming a population of 750,000). The latter is relatively high in comparison with countries with similar size and income level and is explained by the low population density. In addition, there are mule tracks and footpaths, since less than 50 percent of the population lives within half a day's walk from the nearest road.

Table 3: Bhutan Road Network by Function (km), 2002

	DOR			OTHERS			TOTAL		
	Paved	Unpaved	Total	Paved	Unpaved	Total	Paved	Unpaved	Total
National Highways	1051	11	1062	478	18	496	1529	29	1558
District Roads	297	118	415	62	-	62	359	118	477
Feeder Roads (1)	161	393	554	205	334	539	366	727	1093
Urban Roads	80	9	89	-	-	-	80	9	89
Forest Roads	-	-	-	-	530	530	-	530	530
TOTAL	**1589**	**531**	**2120**	**745**	**882**	**1627**	**2334**	**1413**	**3747**
Paved (percentage)	75%			46%			62%		

Source: Road Master Plan Table 3.1

To minimize construction costs, given the topography, roads have been built following land contours, with few bridges and no tunnels. Therefore, they are narrow, with numerous sharp curves and steep gradients, limiting speeds to 20-40km per hour. Typically road distances are two to two-and-half time the straight-line distance between two points. For instance it still takes about three days to cover the East-West highway, which is about 550 km, for a straight-line distance of slightly over 200 km. In addition, roads are often closed for several days by landslides during the monsoon and occasionally during heavy snowfalls.

While over 60 percent of the network is paved, roughness is high partly due to the prevalent road construction and maintenance methods and partly due to low quality of initial construction. Road surfacing is hand-laid rather than machine-laid and, therefore, it is difficult to achieve better surfaces even on paved roads. On the basis of their surveys, the RMP consultants have estimated that roads with an International Roughness Index (IRI) in excess of 10m/km can be considered in poor condition.

Table 4: Roads in Poor Condition

Road Function	Length in Km	Percent
National Highways	287	18
District Roads	252	53
Feeder Roads	935	86
All	1064	34

Source: RMP, Table 3.3

[10] Much of the information presented below on the road sector is from the ADB financed Roads Planning and Management Strengthening Project, Draft Final Report, March 2002. This project is generally referred to as the Road Master Plan (RMP) and will be so referred to in this Note.

This figure is misleading for two reasons One, the RMP chose 10m/km as the roughness beyond which a road is judged to be in poor condition; internationally this figure is 5m/km for surface treated roads—in fact beyond 7m/km the road is judged to be in very poor condition. It would be fair to say that more than a third of the roads in Bhutan are in very poor condition, and a much higher percentage are in poor condition. Second, when travel speeds are slow due to poor road geometrics (as in Bhutan), then higher roughness can be "tolerated" provided that the roads are structurally sound (they drain well and do not breakup or develop potholes too often), but even that does not hold true for Bhutan's roads. The bottom line is that the vehicle operating costs on the roads are high.

Routine maintenance is done on the entire network. During the 8th Plan period (FY1997-2002), DOR's expenditures for routine maintenance averaged Nu 60 million per annum, an average of Nu 28,000 per km (about US$600/km). This figure may appear high in relation to international comparators (e.g. Kyrgyzstan, Nepal) but is possibly explained by higher frequency of maintenance operations and inclusion of additional items such as clearing of slides, flood damage, repair of structures, and snow removal as part of routine maintenance operations. Maintenance quality, however, could be further improved by the use of appropriate materials and maintenance technology. Potholes are often filled with organic soil and patching is not effective.

RMP consultants have identified a backlog of resurfacing of the paved network, particularly for roads under the Department of Roads (DOR) of the Ministry of Works and Human Settlement (MOWHS). Because of the relatively low quality of pavements, (inadequate materials and obsolete road construction technology), pavement life is short despite low traffic volumes—new overlays are needed within three to five years, with the road falling into complete disrepair in seven to eight years. Attempts to improve the process, started under a previous ADB project, were not pursued. Resurfacing contracts are too short in length, implying low average size/value per contract, and phased far apart over time; hence providing little incentives for contractors to acquire modern equipment. ADB is starting a new project on the East-West highway, which hopefully will restart the improvement process.

Pavements on mostly border roads still maintained by DANTAK (under the Army Engineering Corps of India Border Force) are younger than those under MWHS. About 50 percent of DANTAK roads have been resurfaced within the last two years and only eight percent of the pavements are over seven years old. Comparatively, about half of the roads under DOR have surfaces seven years and older. DOR resurfaced only about 300km of its national network during the 8th Plan. At this level, it would take more than 17 years to resurface the 1,050-km of national roads under DOR, compared to the seven-eight year maximum life of the pavements.

Besides DOR and DANTAK, there are a number of agencies also building and maintaining roads in Bhutan. The main ones are roads under Dzongkhag administrations (131 km) and the Departments of Agriculture (126 km), Forestry (530 km) and Education (38 km). Roads were also built in connection with the construction of hydropower stations (161 km) and communications facilities (68 km). These roads total over 1000 km, about twice the length of DOR feeder roads. Their standards are somewhat lower than those of DOR feeder roads.

Until now, agricultural roads were built as part of agricultural development projects. So far most of them are in the Paro area, built under a Japanese grant, which served in parts to purchase road construction equipment. As the roads were recently completed, the question of their maintenance has not been resolved yet, but the intention is to have the communities maintain them. The equipment obtained under the Japanese grant has been moved from the Paro area to a more central location in Bumthang for deployment in various parts of the country. However, according to a new Japanese feasibility study, "The Study of Agriculture and Farm Road Development in Lhuntse and Mongar Districts in the Kingdom of

Bhutan", January 2003, most of this equipment, procured before the mid-90s, is non-operational, and requires major and costly repairs.

The Department of Agriculture (DOA), plans to build about 500 km of farm roads during the 9th Plan period. The department would provide the equipment, from the pool mentioned above, the materials and skilled manpower, while the communities would supply labor. They estimate their cost at Nu 1.25-1.5 million/km. This would be about one-fifth of DOR estimated construction cost of feeder roads during the same plan period. The above-mentioned Japanese study indicated the estimated cost of farm roads to about Nu 5.5 million/km, with the labor contribution of the beneficiaries valued at 16 percent of this cost. Some support for the farm road program is expected from various sources such as IFAD, the European Union (EU), the Swiss Development Corporation (SDC), GTZ and Japan, mostly through agricultural development projects. However, more than half of the program remains to be funded at the beginning of 2003.

Forestry roads are now built and maintained entirely by the Forest Development Corporation (FDC). Exploitation of forest resources was corporatized in the mid-80s under the name of Bhutan Logging Corporation, which became the FDC, under the Company's Act of 2000. The FDC has its own articles of incorporation and mandate, completely separate from the Forestry Department, except for its Director and Deputy Director, who remain civil servants, detached to the Corporation. Road construction and maintenance is the most expensive part of their logging operations. In addition, the Corporation is under pressure to provide access to communities in the areas under exploitation. Often, this increases the cost of the roads, as they have to deviate from the most direct route. FDC also estimates its construction cost to about Nu 1.5 million/km. However, this estimate is based on the 1994 schedule of rate and they can no longer find contractors willing to work for these prices. Also, this is for the old "bulldozer" technique, which is no longer allowed by the Environmental Department.

Both DOA and the FDC advocate greater coordination with DOR in providing accessibility to isolated areas. It would thus be useful in the future to consider a network approach to minimize the cost of providing access to a given area. Given the topography and scattered pattern of settlements, building feeder roads at DOR standards, to serve all settlements can be expensive. An alternative would be to minimize the cost of the feeder roads and complement the feeder road serving as a spine by short agriculture/farm roads and forestry roads. Ropeways, for cargo only, may also be considered for the most difficult areas, where road construction costs would be prohibitive.

Vehicle Fleet

The vehicle fleet has grown rapidly in recent years. From a total of 13,600 vehicles at the end of 1997, it reached over 24,000 at the end of 2001, a growth rate of over 15 percent per annum. Light vehicles and in particular taxis, increased faster than the average, while two-wheelers increased at a slower pace. Almost 90 percent of the vehicles are in the western areas of Thimphu and Phuentsholing. Over two-thirds of the light vehicles are in the capital area, while 70 percent of the trucks are registered at Phuentsholing. In order to streamline the transport system, all motor vehicle related activities including registration and licensing, roadworthiness and emission tests were consolidated under the Road Safety and Transport Authority (RSTA) since the beginning of 1997.

Table 5: Number of Registered Vehicles (as of December 2001)

Region	Light	Taxis	Medium	Heavy	Two Wheels	Earth Moving	Other	TOTAL	In percent
Thimphu	6691	1013	411	553	5160	135	397	14360	59
Phuentsholing	2653	379	261	1923	1837	287	17	7357	30
Gelephu	383	18	46	96	627	14	89	1273	5
S/Jongkhar	344	13	52	175	747	48	81	1460	6
TOTAL:	**10071**	**1423**	**770**	**2747**	**8371**	**484**	**584**	**24450**	**100**

Traffic

DOR had regular traffic counts from 1987 to 1992, but these were discontinued and traffic surveys are now only carried out on an ad hoc basis, mostly in connection with project preparation for external financing. Consultants for the RMP conducted counts on over 70 road sections in 2001. Traffic volumes are highest in the vicinity of Thimphu and Phuentsholing, with the busiest section on the short stretch from Thimphu to Semtokha. Traffic on this section averaged 2,280 vehicles per day (vpd), excluding two-wheelers. The Government is building a 6km two-lane expressway on a new alignment along the river, which should be completed by the end of 2005. This new and straighter road should relieve congestion on the existing narrow and winding road.

The next highest traffic level, about 900 vpd, is on the Semtokha-Chuzom section, which is the common section of the roads to Phuentsholing and Paro (airport). Traffic then divides roughly equally, at about 450 vpd on the roads to Phuentsholing and Paro. On the East-West highway, traffic reaches 500-600 vpd from Semtokha to Wangdue, and falls markedly further east, with about 100 vpd to Trongsa and 50-100 vpd further east. Average flows given in the RMP are 70 vpd on national roads, 23 vpd on district roads and 19 vpd on feeder roads. Over 50 percent of total traffic is carried on only 15 percent of the network. Traffic has been growing at 10-15 percent per annum on the Thimphu -Phuentsholing road and at over 20 percent per annum on the East-West highway. The RMP forecast growth gradually moderating, from 11.5 percent per annum during the 9th Plan period to 4.5 percent per annum in the 12th Plan ending in 2022.

As indicated by vehicle registration and traffic levels, there is a large concentration of economic activity in the west of the country and particularly around the three towns of Thimphu, Phuentsholing and Paro. Government has expressed concern about the very rapid growth of these three towns, due to migration from other parts of Bhutan. At present, only 20 percent of the population lives in urban areas. A major effort is underway to provide services in smaller towns in the East of the country as well as access roads, necessary to give rural areas access to these services.

Road Safety

The Road Safety and Transport Act of 1999 defines the roles of the RSTA and the traffic police in implementing the road traffic safety rules. The Act reflects modern practice and the traffic safety rules are in line with international practice. Despite rapid traffic growth, the number of reported accidents has declined to around 250 with some 15 fatalities per annum—this translates to six annual fatalities per 10,000 vehicles, which is very low in comparison with the Lower and Middle Income Countries (LMIC) range of 5-100 annual fatalities per 10,000 vehicles.

Road Transport Services

All freight and passenger transport services have been privatized. The RSTA regulates the industry and sets tariffs. Those are binding for passenger transport but considered indicative for freight.

Table 6: Domestic Road Freight Rates
[Nu per ton-km (US cents per ton-km]

Type of Truck	Hill Section	Plain Section
8 to 10 ton	4.28 (9.0)	2.40 (5.0)
4 to 8 ton	3.40 (7.1)	2.16 (4.5)

In 1997, RSTA contracted out routes for passenger services to private operators through bidding. The contracts regulate frequency, quality of service and fares on each assigned route. In 2000, there were 28 operators, including Bhutan Post, a state owned corporation. Operators own 79 buses and in 2000, they transported some 750,000 passengers. For services on non-profitable routes, the Government has offered interest free loan to operators for the purchase of buses. Fares range from Nu 0.5 to over 0.93 per passenger-km (pkm) (1–2 cents per pkm), depending on the terrain and road quality of particular routes. Fares on flat Indian roads are only Nu 0.3 per pkm.

Affordability is the priority of RSTA. While sustainability of the operators is carefully considered, RSTA attempts to keep fare rates at the lowest possible level. Since contracts were signed in 1997, fares have been revised regularly. On the whole, operators seem to manage and cover their operating costs, but not depreciation. An analysis of the operating costs of buses operated by Bhutan Post indicates that present fares only cover total costs with full occupancy of the buses. While occupancy is around 90 percent in the four winter months, it falls to only 30 to 40 percent the rest of the year. Private operators are likely to have lower operating costs than Bhutan Post, because of lower overhead and staff cost. They have fewer buses and some are even owner operated. Bhutan Post level of service is also higher, as they do provide replacement buses in case of mechanical failure, while other operators do not. They also sell tickets for part of the route, without assurance to find more passengers along the way. Private operators frequently charge the cost of the whole route, even to passengers traveling only part of it. A more detailed study of the situation is clearly warranted to assist RSTA in its fare setting mechanism.

Bhutan Post is also operating a new urban bus service in Thimphu, on behalf of the Government. The service operates ten buses during morning and evening peak times only and serves primarily for the transport of school children. The Government bought the buses and the fares cover about half the operating cost of the service, estimated at Nu 3 million in 2002.

Civil Aviation

The Department of Civil Aviation operates the only airport of the country at Paro. During the 8th Plan, the airport was improved both in term of facilities, with the completion of the new terminal building, the cargo complex and the control tower and in term of security, with the installation of passenger and baggage detecting equipment, airport security lighting and fire fighting and rescue service. Despite these improvements and in the absence of instrument lending facilities, the airport remains a daytime and good weather only operation.

The Government has approved the introduction of domestic helicopter service in the country. While some operators have expressed interest, they have not yet been able to fulfill the technical and financial terms and conditions. The short tourist season (spring and fall) is not conducive to developing a profitable year-round activity and costs have also been deemed prohibitive for emergency helicopter services.

An alternative would be to investigate the feasibility of having landing strips, suitable for smaller fixed-wing aircraft, in various parts of the country. The opening of formerly military airports in nearby India—Guhati (Assam) and Bagdogra (Darjeeling)—to civilian traffic may also offer opportunities for short flights bringing international traffic by small planes to such landing strips.

A potential site for a new airport has been identified in the region of Wangdue and would be about three hours from the capital, about double the time from Paro airport. Construction would be expensive, including a new access road of about 30 km. A Civil Aviation Mater Plan is now under preparation with the assistance of Sida (Sweden).

Druk Air, a state owned corporation operates two aging BAe 146-100 (respectively 15 and 12 years old), the first one entered service with Druk Air in 1988. Because of the difficulties in flying into Paro mentioned above, utilization of the planes is rather low at less than 2000 hours per year. Maintenance of these aircraft is also expensive, as there are no spares readily available in the region[11]. The Government extended loans for the acquisition of the aircraft, but so far Druk Air has not been servicing the debt. The Corporation basically covers operating costs but neither depreciation nor debt service. Occupancy is around 65 percent.

Table 7: Druk Air: Financial Summary
(Nu Million)

	2000	2001	2002 un-audited
Total Operating Revenues	394	394	460
Total Operating Expenditures	368	365	456
Profit before Depreciation	26	28	4
Depreciation	61	61	61
Net after Depreciation	-35	-33	-57

Source: Druk Air

Table 8: Druk Air -Traffic
(Million Passengers)

	2000	2001	2002
Available seat-km	60.1	85.2	96.4
Revenue Passenger-km	38.5	58.0	61.5
Occupancy in %	64	68	64

Source: Druk Air

[11] Most regional Airlines operate Boeing or Airbus aircraft.

Transport and Trade

Bhutan trade suffers from the typical problems affecting all land lock countries requiring transit facilities through their neighbors: excessive delays through ports, inefficiencies at land border crossings, limitations on routes for transit cargo and on the use of their own transport companies. The competitiveness of local products on foreign markets is further reduced by the high cost of transport within Bhutan and the unbalanced trade flows, resulting in a shortage of back loads.

In the four years from 1997 to 2001, imports increased at 16 percent per annum, while exports only grew at two percent per annum, including electricity sales to India. Exports to countries outside the SAARC fluctuate but without definite growth trend.

Bhutanese trade is dominated by its exchanges with India. In 2001, India took 94 percent of Bhutan's exports and accounted for 80 percent of its imports. Trade with countries outside the SAARC is mostly imports, with exports accounting for only one percent of total exports.

Table 9: Import and Export Trend including Electricity
(Nu Million)

Trade	Country	1997	1998	1999	2000	2001	Annual Growth Rate in % 1997-2001
Imports	India	3454	3621	5845	7463	7041	19
	SAARC*	41	83	54	74	80	18
	Others	1483	1813	1935	1570	1960	7
	Total	4978	5516	7835	9107	9081	16
Exports	India	4042	4176	4711	4377	4430	2
	SAARC*	205	208	26	193	252	5
	Others	27	71	251	46	27	0
	Total	4274	4456	4988	4616	4709	2
Electricity Exports		1288	1339	2018	NA	NA	-
Exports w/o electricity		2986	3117	2970	NA	NA	-

Source: Bhutan trade Statistics (Department of Revenue and Customs, MOF)
Note (*): SAARC Countries excluding India

For transport planning, one should have tonnage rather than value of trade. This is difficult to obtain since custom statistics record trade quantities in a variety of ways according to the type of goods. It can be by weight, but also by volume for liquid cargo and by piece for machinery, vehicles, equipment, etc. The only estimates of trade volumes available are for 1997 (dry cargo only), in two study reports. These are the Dry Port Feasibility Study of 1998, by Chakra Infrastructure Consultants of India and "The Role of Transport in Developing Bhutan's Exports", February 1999, the report of a freight transport expert, prepared as part of the Bhutan Trade Development Project supported by the European Union.

Table 10: International Traffic (Dry Cargo), 1997
(Tons Thousand)

Imports	India	290
	Other	114 (of which 20 percent in container)
	Total	404
Exports	India	336
	Other	30 (of which 20 percent in container)
	Total	366

Source: Dry Port Feasibility Study

The estimates above further illustrate the great imbalance in trade flows to and from Bhutan. This imbalance is even more pronounced in the case of liquid cargo as all fuels are imported from India. With traffic so predominantly in one direction, transport costs are increased further as return loads are generally not available.

Transit agreements have been signed with India and Bangladesh. The latest agreement with India signed in 1995 for ten years still has two years to go. The trade agreement with Bangladesh is not very specific and the transit agreement was not activated. This is attributed to the fact that Bhutan and Bangladesh do not have a common border and transit through India is required.. India also allows, in principle, Bhutanese trucks to carry goods to their final destination in India. However, to avoid problems on the way, it is customary to trans-ship the goods to Indian trucks at the border. Cost of unloading and reloading were quoted in 1999 at Nu 1,200 to 1,500 per truck, equivalent to about Nu 150/ton. It is estimated that truck costs per ton-km within Bhutan are about four times those with larger trucks on flat roads in India.

While gradual integration into the global trading system is a key objective of RGOB policy the current trade regime is obviously and predominantly regional.

India – Under the 1949 agreement on Trade and Commerce between Government of The Kingdom Of Bhutan and the Republic of India, Bhutan enjoys a tariff-free trade with India. This agreement allows trade between the two countries without the application of duties and also provides for transit of goods from Bhutan to and from third countries without the application of Indian tariffs.

Bangladesh – Agreement on Trade with Bangladesh in 1980 provides concessions on duties on a range of negotiated products.

SAARC – Bhutan continues to push for greater liberalization of tariffs in the region and work towards the transition to a South Asia Free Trade Area by 2002.

WTO – Bhutan was granted observer status in 1998. Bhutan anticipates full membership in the near future.

Phuentsholing is the main border post and over 80 percent of Bhutan's trade transit there. Both the Dry Port Feasibility Study and the EU report strongly recommended the construction of a dry port at Phuentsholing, including cold storage facilities. Unfortunately the site identified in the feasibility study was damaged by floods and is no longer available. ADB has expressed interest in supporting a new feasibility study to be followed by a possible project.

Little use is made of air transport for trade. Most air cargo is in the form of accompanied luggage or excess baggage of returning Bhutanese traders. Space would therefore be available for exports, particularly to Bangkok for high value commodities. According to the EU study, Druk Air charged US$4 per kg in 1999 from Paro to Bangkok, the same rate as for excess luggage, "when much lower rates are charged by other carriers on routes even as far as Europe". It was suggested that Druk Air should review its rate for export cargo to take advantage of its available capacity on outgoing flights. The problem of reliability, important for perishables like fresh mushrooms, would remain, because of the frequent delays and/or cancelled flights due to weather conditions.

Clearly, there is need for some technical support for developing transport logistic services and management, in order to find ways to minimize the total cost and time of moving trade cargo from origins to destinations.

III. Public Expenditures in Transport

Public Expenditures in the 8th FYP (1997-2002)

Public expenditures in the transport sector averaged about ten percent of total public expenditures over the 8th Plan period. Capital expenditures accounted for 81 percent and current expenditures 19 percent. Roads absorbed 92 percent of all transport expenditures, followed by civil aviation (five percent) and RSTA (three percent). As a percent of GDP, transport expenditures increased from over three percent at the beginning of the 8th Plan period to over five percent in the last two years. This is high in comparison with most other countries and reflects the high cost of infrastructure given the topography and geology of the country.

Overall, domestic revenues finance about half of public expenditures, the other half being met by grants and to a lesser extent borrowings. GOI provides program and project grants, which in recent years have been equal to about 30 percent of domestic revenues. For the transport sector, the RGOB financed 75 percent of the expenditures, while grants (20 percent) and loans (five percent) financed the remainder. The RGOB portion includes program support from GOI, of about 15 percent of total budget.

In the first two years of the 8th Plan, actual expenditures fell well short of budget estimates. While the current expenditures were met, the capital expenditures fell short of expectation. As the plan progressed and financing was obtained from donors, the disparity between actual and budget virtually disappeared. The same situation may repeat with the 9th Plan, which started in July 2002, as about 20 percent of the plan remained un-funded prior to the February 2003 round table in Geneva. The shortage may be even larger, as the expected support from GOI at 30 percent of total plan expenditures (Nu 20 billion) has not been finalized either.

In addition to budgets for MOC's departments (DOR, RSTA, Civil Aviation), the national budget provides an annual "interest" grant to Druk Air to cover the interest on its loans for its airplanes. Further loans were made in 2000 for the purchase of new aircraft, which fell through as already mentioned.

Table 11: Bhutan Public Expenditures in the Transport Sector (Nu Million)

	Actual				Apvd. Est.	Total	Apvd. Est.
	1997/98	1998/99	1999/00	2000/01	2001/02	8th Plan	2002/03
ROADS							
Expenditures							
Current	107.0	103.0	114.0	156.0	201.0	681.0	202.0
Capital	350.0	345.0	710.0	874.0	937.0	3,216.0	1,058.0
Total	**457.0**	**448.0**	**824.0**	**1,030.0**	**1,138.0**	**3,897.0**	**1,260.0**
Sources							
RGoB	281.0	283.0	578.0	734.0	946.0	2,822.0	856.0
Grants	112.0	65.0	246.0	262.0	65.0	750.0	83.0
Loans	64.0	-	-	33.0	127.0	224.0	321.0
Total	**457.0**	**348.0**	**824.0**	**1,029.0**	**1,138.0**	**3,796.0**	**1,260.0**
RSTA							
Expenditures							
Current	8.0	10.0	14.0	13.0	14.0	59.0	15.0
Capital	1.0	4.0	20.0	19.0	7.0	51.0	15.0
Loans	3.0	1.0	1.0	2.0	-	7.0	-
Total	**12.0**	**15.0**	**35.0**	**34.0**	**21.0**	**117.0**	**30.0**
Sources							
RGoB	12.0	15.0	30.0	35.0	21.0	113.0	30.0
Grants	-	-	5.0	-	-	5.0	-
Total	**12.0**	**15.0**	**35.0**	**35.0**	**21.0**	**118.0**	**30.0**
CIVIL AVIATION							
Expenditures							
Current	7.0	13.0	17.0	17.0	20.0	74.0	24.0
Capital	58.0	29.0	29.0	6.0	37.0	159.0	43.0
Total	**65.0**	**42.0**	**46.0**	**23.0**	**57.0**	**233.0**	**67.0**
Sources							
RGoB	14.0	29.0	26.0	22.0	57.0	148.0	67.0
Grants	51.0	13.0	20.0	-	-	84.0	-
Total	65.0	42.0	46.0	22.0	57.0	232.0	67.0
TOTAL EXPENDITURES	**534.0**	**505.0**	**905.0**	**1,087.0**	**1,216.0**	**4,247.0**	**1,357.0**
Roads in % of Total Exp.	85.6	88.7	91.0	94.8	93.6	91.8	92.9
GDP	**13,994.0**	**16,078.0**	**18,514.0**	**21,127.0**	**22,500.0**		
Transport Exp. in % of GDP	3.8	3.1	4.9	5.1	5.4		
BUDGET	**4,915.0**	**7,595.0**	**8,783.0**	**11,280.0**	**10,110.0**	**42,683.0**	**10,944.0**
Transport Exp. in % of Budget	10.9	6.6	10.3	9.6	12.0	10.0	12.4
Subsidies and Transfers to Druk Air							
Loans	-	-	109.0	236.0	-	345.0	
Grants	41.0	37.0	33.0	29.0	25.0	165.0	
Total	**41.0**	**37.0**	**142.0**	**265.0**	**25.0**	**510.0**	

Notes: Since 2000/01, Road expenditures include direct budget transfers to local authorities for roads.
For 2001/02 and 2002/03, figures are from the approved budget.

Source: MOF, Department of Budget and Accounts.

Road Expenditures in the 8th and 9th Five-Year Plans

The table below gives more details about road expenditures, which dominate sectoral expenditures.

Table 12: Expenditures of Department of Roads in 8th Plan (Actual) and 9th Plan (Proposed) (Nu Million)

	Actual				Estimates	Total	Proposed
	1997/98	1998/99	1999/00	2000/01	2001/02	8th Plan	9th Plan
HQ/Admin.	76.8	108.5	121.7	85.9	79.0	471.9	460.0
Roads							
Maintenance							
National Roads	27.3	27.7	30.8	41.5			
District	7.4	8.4	9.4	11.3			
Feeder	4.3	5.0	5.5	8.5			
Urban	2.4	3.1	4.0	5.4			
Total Maintenance:	41.4	44.2	49.7	66.7	92.0	294.0	819.0
Resurfacing	92.3	56.6	110.6	67.2	150.0	476.7	1,100.0
World Food Program	11.6	10.9	20.4	13.0	13.0	68.9	
Monsoon/snow	28.1	91.8	111.5	176.4	83.0	490.8	
Construction	193.7	76.9	299.8	419.3	490.0	1,479.7	3,528.0
Equipment							120.0
Bridges							
Maintenance	3.3	4.1	7.0	2.0	3.0	19.4	9.0
Construction	9.5	54.6	103.3	171.9	195.0	534.3	624.0
TOTAL	**456.70**	**447.60**	**824.00**	**1,002.40**	**1,105.00**	**3,835.70**	**6,660.00**
Sources of Funds							
Budget (1)	281.0	383.0	578.0	707.0	915.0	2,864.0	-
GOI (projects)	86.0	25.0	228.0	209.0			
ADB	49.0			6.0			
WB				38.0			
Others	41.0	40.0	18.0	42.0			
Total	457.0	448.0	824.0	1,002.0	915.0	2,864.0	-
Budget in %	61.53%	85.57%	70.15%	70.53%	82.81%	74.67%	

Note: (1) The budget includes GOI program grant, which makes about 15% of public expenditures.

Sources: Actual from Road Master Plan, Appendix 8.1.3;
2001/02, WB estimates based on MOC data and MOF total;
9th Plan from MOC's 9th Plan Document, June 2002.

The table below shows estimate of annual needs for maintenance and resurfacing based on unit costs given in the RMP, and assuming a seven-year cycle for resurfacing. The plan allocation, 819 million over five years, is more than the need for routine maintenance, estimated at Nu 545 million and would allow partial funding of monsoon repairs. For resurfacing, the need would just match the allocation of Nu 1.1 billion over five years, if one takes the DOR estimated cost per km of about Nu 1 million, rather than the RMP estimate of Nu 840,000. This means that, if achieved, the planned resurfacing would meet the needs for the period, but would not start reducing the backlog.

Table 13: DOR Estimated Annual Costs of Routine Maintenance and Resurfacing (Nu Thousand)

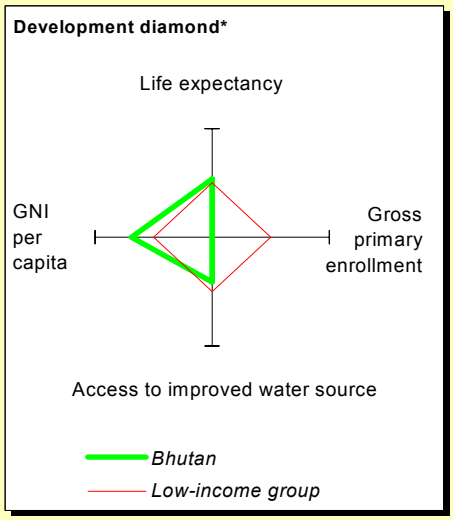
	Routine Maintenance			Resurfacing (7 year cycle)			
	Km	**Cost/Km**	**Cost per annum**	**Total Km**	**Km/year**	**Cost/Km**	**Cost per annum**
National Highways	1062	60	63720	1051	150	840	126120
District Roads	415	50	20750	297	42	840	35640
Feeder Roads (1)	554	30	16620	161	23	700	16100
Urban Roads	89	90	8010	80	11	1100	12571
Total:	**2120**		**109100**	**1589**	**226**		**190431**

Source: Unit costs from RMP. DOR cost estimates for the 9th Plan are somewhat lower for maintenance and 20 percent more for resurfacing.

Bhutan at a glance

8/20/03

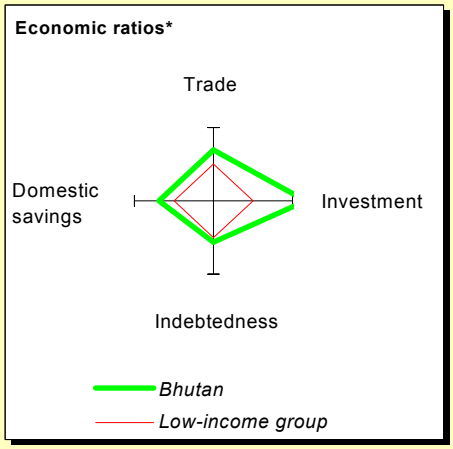
POVERTY and SOCIAL	Bhutan	South Asia	Low-income
2002			
Population, mid-year *(millions)*	0.85	1,401	2,495
GNI per capita *(Atlas method, US$)*	590	460	430
GNI *(Atlas method, US$ billions)*	0.50	640	1,072
Average annual growth, 1996-02			
Population *(%)*	2.9	1.8	1.9
Labor force *(%)*	2.6	2.3	2.3
Most recent estimate (latest year available, 1996-02)			
Poverty *(% of population below national poverty line)*	..	..	..
Urban population *(% of total population)*	8	28	30
Life expectancy at birth *(years)*	63	63	59
Infant mortality *(per 1,000 live births)*	54	71	81
Child malnutrition *(% of children under 5)*	19	..	..
Access to an improved water source *(% of population)*	62	84	76
Illiteracy *(% of population age 15+)*	..	44	37
Gross primary enrollment *(% of school-age population)*	..	97	95
Male	..	108	103
Female	..	89	87



KEY ECONOMIC RATIOS and LONG-TERM TRENDS

	1982	1992	2001	2002
GDP *(US$ billions)*	0.16	0.25	0.53	0.59
Gross domestic investment/GDP	40.7	50.0	48.1	..
Exports of goods and services/GDP	14.0	32.7	23.2	..
Gross domestic savings/GDP	9.5	25.6	27.9	..
Gross national savings/GDP	-11.6	14.0	33.0	..
Current account balance/GDP	-43.7	-10.1	-20.5	..
Interest payments/GDP	0.0	0.7	0.3	0.3
Total debt/GDP	0.7	36.4	50.3	63.4
Total debt service/exports	0.0	6.9	4.2	4.6
Present value of debt/GDP	..	..	46.4	..
Present value of debt/exports	..	..	164.6	..

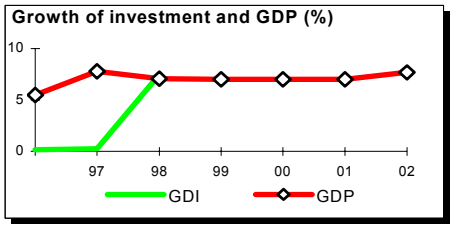
	1982-92	1992-02	2001	2002	2002-06
(average annual growth)					
GDP	7.0	7.0	7.0	7.7	..
GDP per capita	4.7	3.9	4.0	4.8	..
Exports of goods and services	..	..	..	..	..



STRUCTURE of the ECONOMY

	1982	1992	2001	2002
(% of GDP)				
Agriculture	53.7	39.8	35.4	33.9
Industry	18.3	28.9	36.2	37.4
Manufacturing	4.7	10.5	8.1	8.1
Services	28.0	31.3	28.4	28.8
Private consumption	69.0	55.3	51.6	..
General government consumption	21.5	19.1	20.5	..
Imports of goods and services	45.2	57.2	43.4	..

	1982-92	1992-02	2001	2002
(average annual growth)				
Agriculture	3.8	4.1	3.2	2.5
Industry	11.0	9.0	13.4	12.0
Manufacturing	14.3	4.3	7.3	4.8
Services	9.2	7.3	4.2	8.8
Private consumption	..	..	..	..
General government consumption	..	..	..	..
Gross domestic investment	5.4	5.1	..	..
Imports of goods and services	..	..	..	..



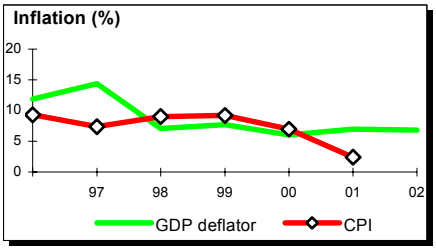
Note: 2002 data are preliminary estimates.

This table was produced from the Development Economics central database.

* The diamonds show four key indicators in the country (in bold) compared with its income-group average. If data are missing, the diamond will be incomplete.

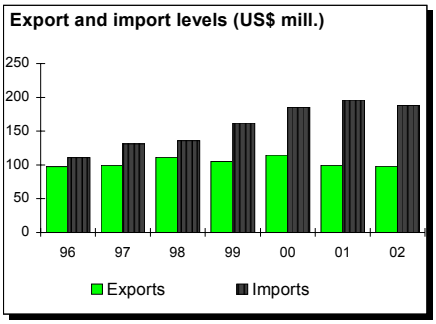
PRICES and GOVERNMENT FINANCE

	1982	1992	2001	2002
Domestic prices				
(% change)				
Consumer prices	..	16.0	2.4	..
Implicit GDP deflator	11.1	10.7	7.0	6.8
Government finance				
(% of GDP, includes current grants)				
Current revenue	..	18.9	34.9	30.7
Current budget balance	..	0.8	17.1	14.4
Overall surplus/deficit	..	-16.3	-10.0	-4.9



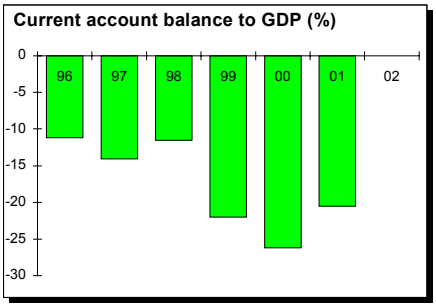
TRADE

	1982	1992	2001	2002
(US$ millions)				
Total exports (fob)	19	63	100	98
n.a.	..	..	..	..
n.a.	..	..	..	..
Manufactures	..	..	..	..
Total imports (cif)	65	83	196	188
Food	..	..	..	..
Fuel and energy	..	..	..	..
Capital goods	..	..	..	..
Export price index *(1995=100)*	..	..	..	..
Import price index *(1995=100)*	..	..	..	..
Terms of trade *(1995=100)*	..	..	..	..



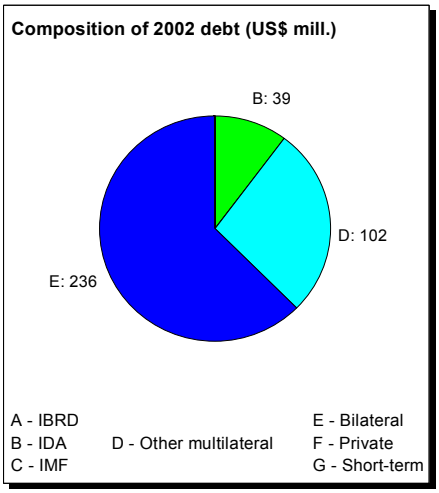
BALANCE of PAYMENTS

	1982	1992	2001	2002
(US$ millions)				
Exports of goods and services	30	86	133	130
Imports of goods and services	101	110	239	228
Resource balance	-70	-25	-106	-99
Net income	0	0	-18	-25
Net current transfers	0	0	84	82
Current account balance	-70	-25	-108	..
Financing items (net)	68	51	84	..
Changes in net reserves	2	-26	24	-20
Memo:				
Reserves including gold *(US$ millions)*	..	..	294	317
Conversion rate *(DEC, local/US$)*	9.5	25.9	47.2	48.2



EXTERNAL DEBT and RESOURCE FLOWS

	1982	1992	2001	2002
(US$ millions)				
Total debt outstanding and disbursed	1	89	265	377
IBRD	0	0	0	0
IDA	0	18	31	39
Total debt service	0	6	6	6
IBRD	0	0	0	0
IDA	0	0	1	1
Composition of net resource flows				
Official grants	4	32	29	0
Official creditors	1	9	75	93
Private creditors	0	-2	0	0
Foreign direct investment	0	0	0	0
Portfolio equity	0	0	0	0
World Bank program				
Commitments	0	0	0	0
Disbursements	0	1	6	6
Principal repayments	0	0	0	0
Net flows	0	1	6	5
Interest payments	0	0	0	0
Net transfers	0	1	6	5



Note: This table was produced from the Development Economics central database.

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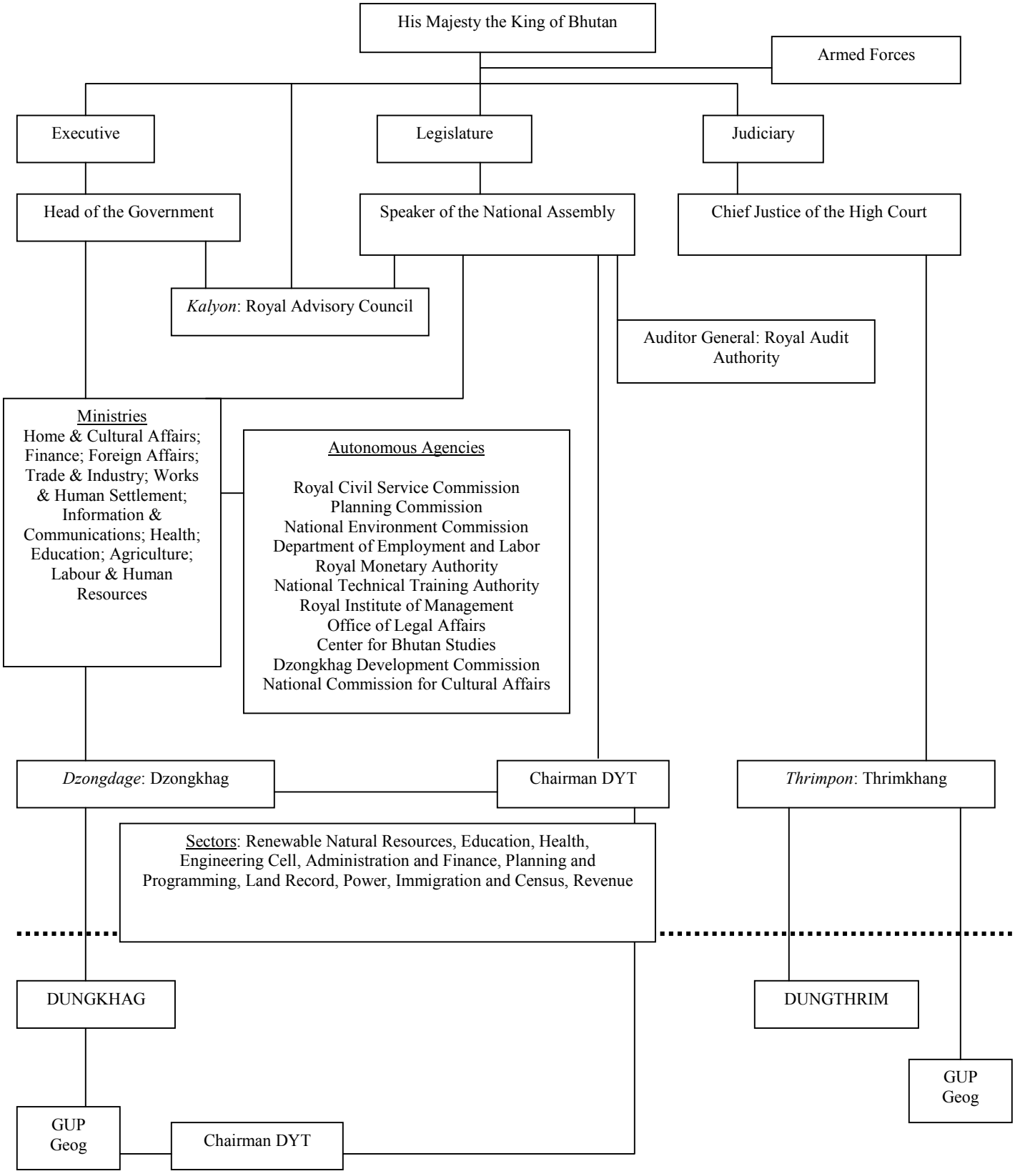
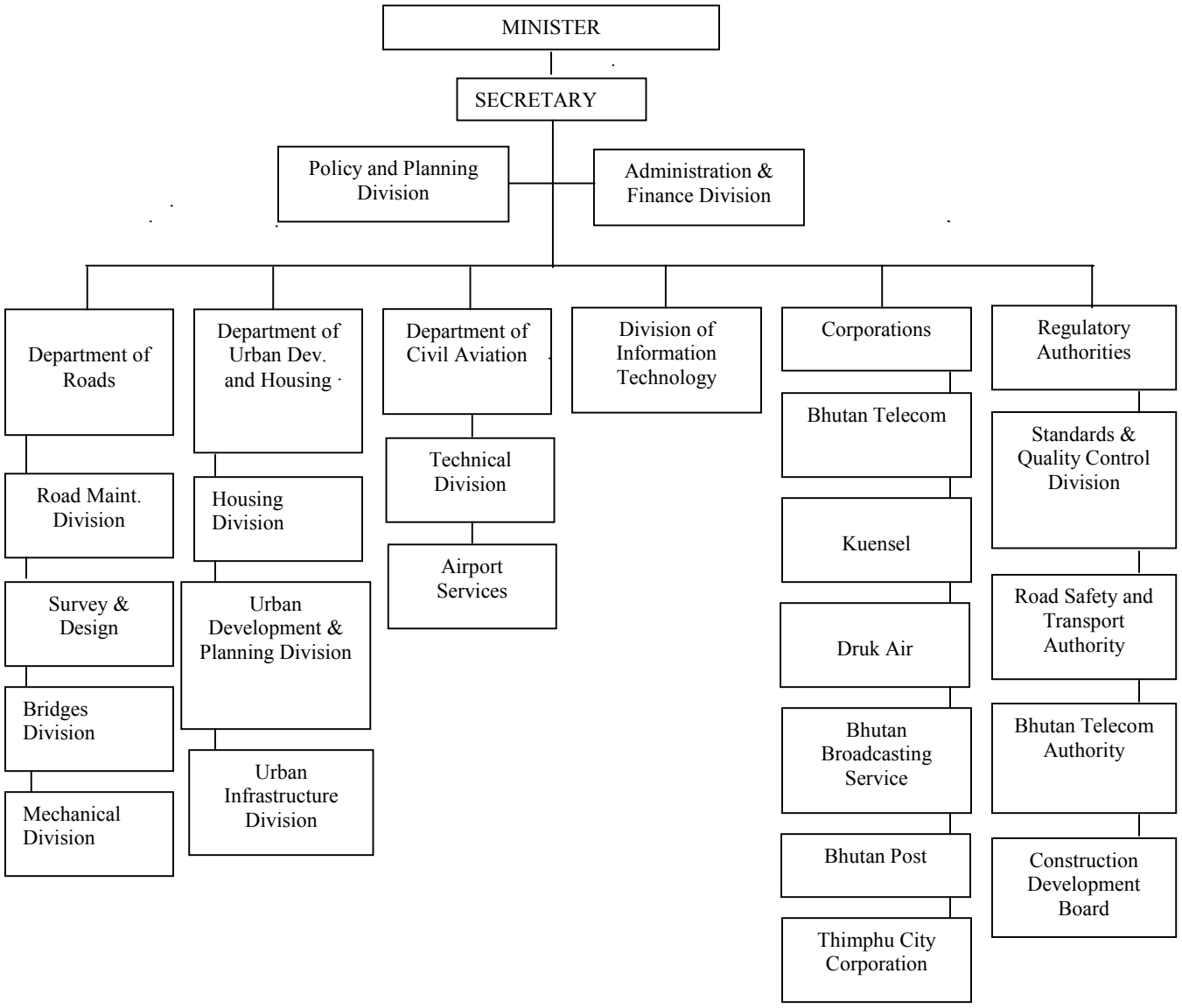
Annex B

Bhutan Governance Structure



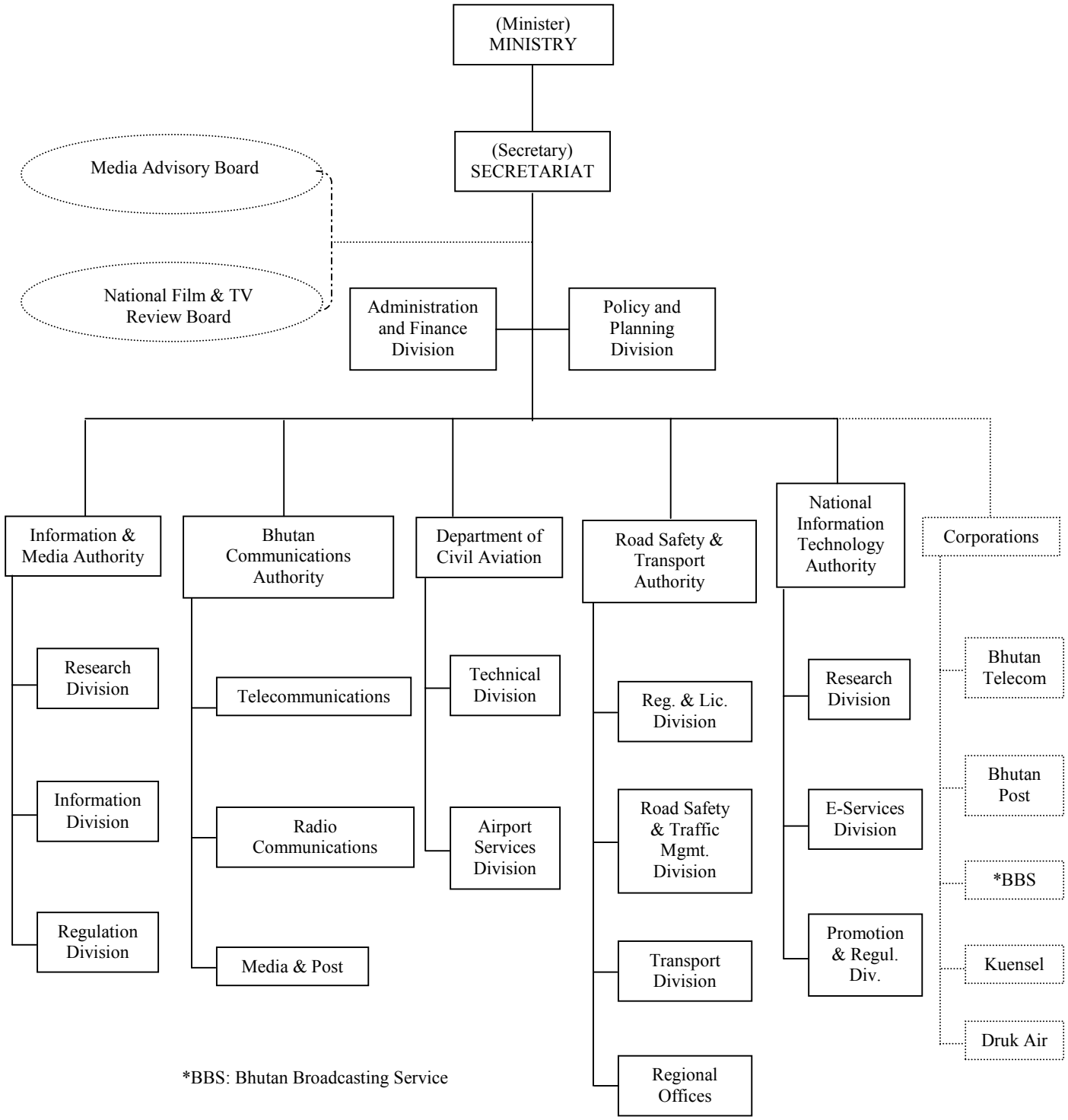
Annex C-1

Organization Structure of the Former Ministry of Communications



Annex C-2

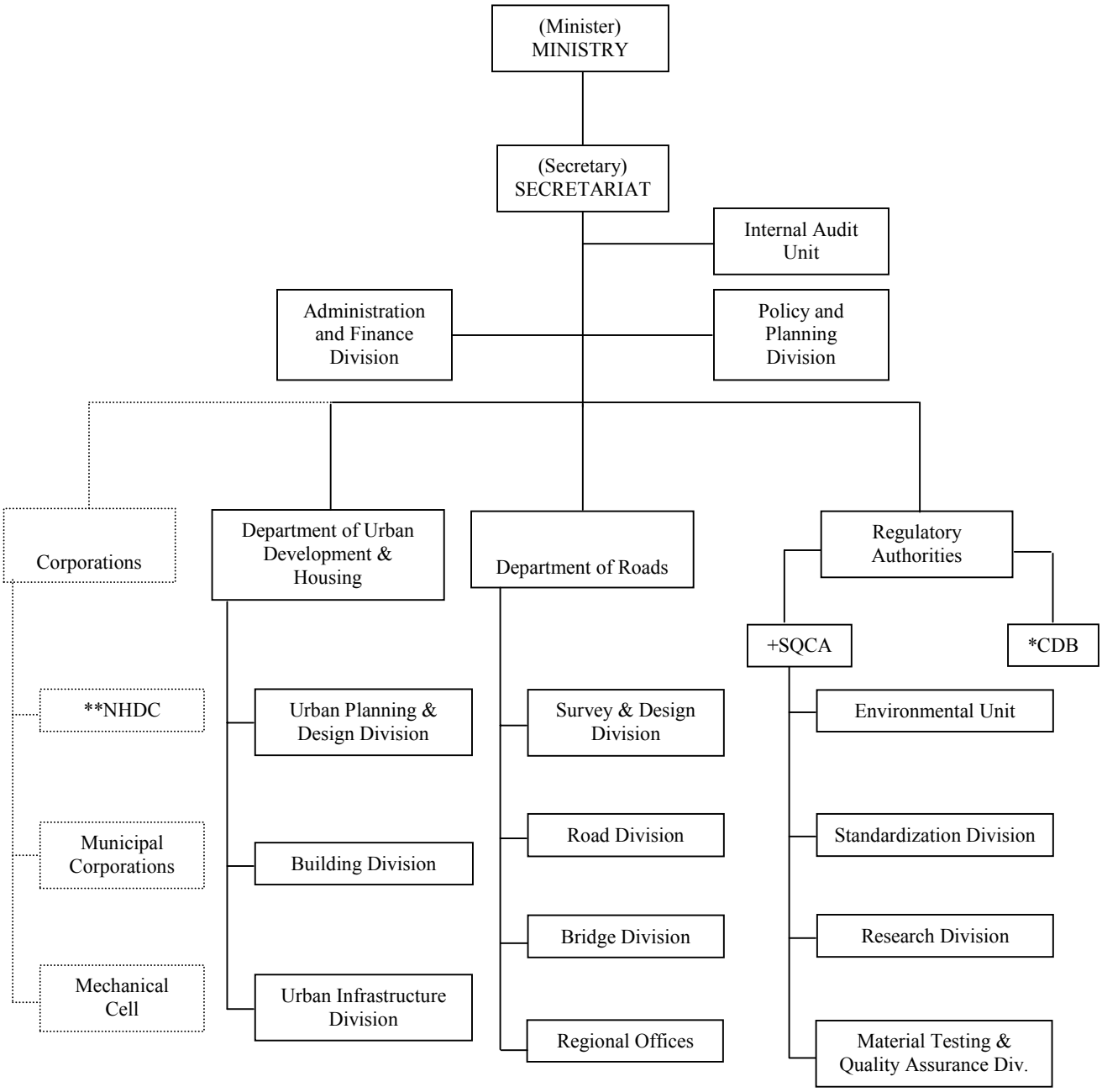
Organization Structure of the Ministry of Information and Communications



*BBS: Bhutan Broadcasting Service

Annex C-3

Organization Structure of the Ministry of Works & Human Settlement



*CDB: Construction Development Board
*NHDC: National Housing Development Authority
+SQCA: Standards & Quality Control Authority

Annex D

Environmental Implications of Road Construction and Improvement Works

A. Road widening and minor realignment works on East-West Highway

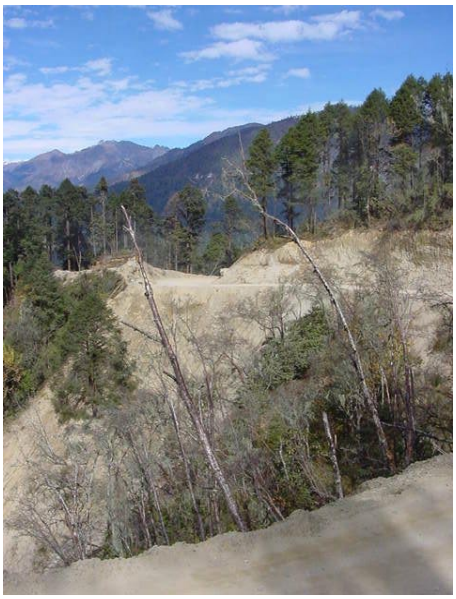


Photo credits: Asif Faiz

B. Roadway excavation: Dakpai-Buli Feeder Road

Photo credits: Asif Faiz

C. Roadside Pre-Mix Carpet (PMC) Plant; East –West Highway

(Bitumen and aggregate 'cooking' with firewood by National Work Force staff, including women with babies)

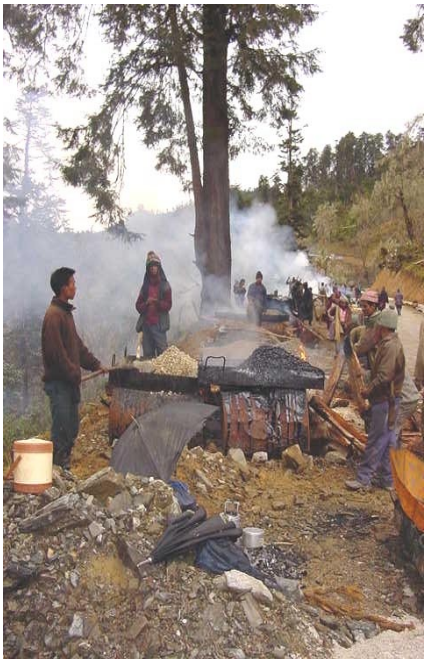


Photo credits: Asif Faiz