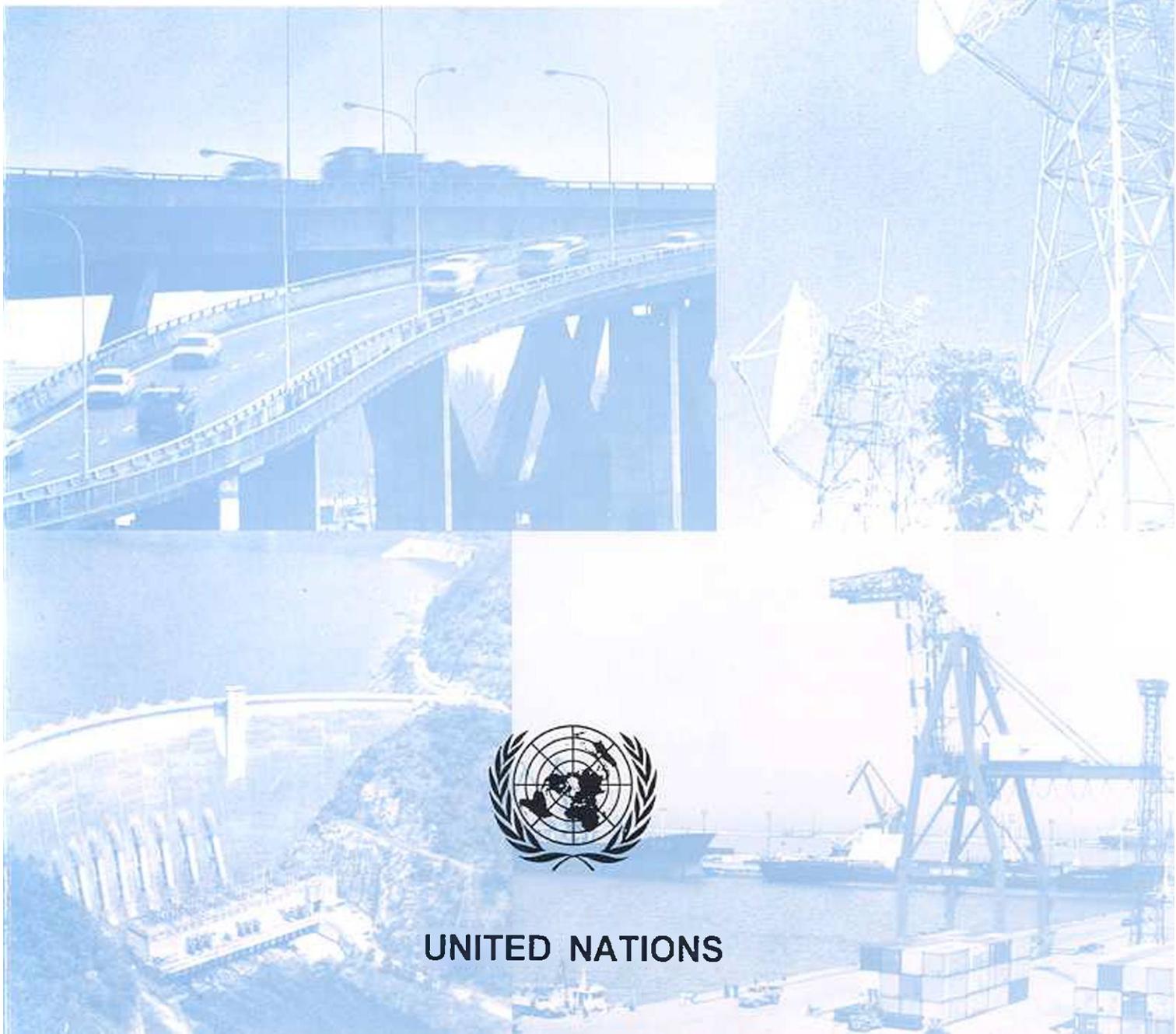


Infrastructure Development as Key to Economic Growth and Regional Economic Cooperation



UNITED NATIONS

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EXECUTIVE SUMMARY

The provision of adequate infrastructure, along with macroeconomic stability and a long-term development strategy, is one of the necessary conditions for sustainable economic and social development. However, in a number of countries of the ESCAP region, power brown-outs or black-outs, traffic congestion in major cities, limited road access to provincial markets and capitals, long waiting times at major ports, inadequate telecommunications services, including long waiting lists for telephones, and shortages of irrigation, drinking and industrial water all bear witness to the inadequacy of existing infrastructure facilities.

Partially in response to such observations and in recognition of the vital role which infrastructure plays in economic development, the Commission at its forty-ninth session, held in Bangkok in April 1993, decided that the theme for its fiftieth session would be "Infrastructure development as key to economic growth and regional economic cooperation" and directed the secretariat to undertake a study on this topic.

The study found that by the year 2000, electrical generating capacity in the region as a whole needed to be doubled, main line telephone connections increased by 184 per cent and an extra two million kilometres of roads (a large proportion of which would be rural roads) constructed.

In the area of the financial resource requirements the main finding of the study was that between 1993 and the year 2000, around \$ 1,400 billion would be required for infrastructure development in the developing countries of the ESCAP region. Of the total, \$ 500 billion was identified as available or already committed. Consequently, the financial "gap" amounts to around \$ 900 billion. This, however, is most likely an understatement as, for example, detailed cost estimates for rehabilitation work were not included.

To place those estimates in perspective, the total amount required to fill the gap is approximately equal to the combined gross national product (GNP) of China, India and the Republic of Korea in 1991. It is also more than 40 times the GNP of Bangladesh. In relation to the international lending

agencies, the combined lending in 1992 of the World Bank and the Asian Development Bank was around \$27 billion, of which around \$7.5 billion was for transport, telecommunications, energy, urbanization and water supply and sanitation in countries of the ESCAP region. If similar amounts were lent each year to the year 2000 it would amount to significantly less than ten per cent of the identified additional financial resource requirement.

In the light of these observations, it is unlikely that sufficient funds will be found from external sources to assist in closing the estimated gap. Consequently, measures in the areas of improving administration and efficiency, and mobilizing additional domestic resources need to be adopted.

In the administration of infrastructure facilities, typical obstacles include overt and bureaucratic regulation. This is manifested in the regulation of prices, controls on maintenance and investment decisions, inability of enterprises to retain profits, responsibility for the provision of various welfare services and facilities, lack of public sector funds for investment and an inability to attract or retain qualified staff. These issues and obstacles need to be addressed so that infrastructure facilities can be operated more effectively.

Cross-country and sensitivity analyses show that significant improvements can be made in the operating efficiency of infrastructure facilities, thereby significantly reducing the infrastructure financing requirement. Similarly, the neglected maintenance of existing assets has seriously impeded the effectiveness with which these assets can be used and imposed higher long-run capital costs.

The lack of planning and coordination of infrastructure development has compounded some of the shortages being experienced. Many ministries and departments are involved in the decision-making process and inadequate physical land-use planning and even non-compliance with established plans have led to duplication and, more frequently, 'missing links' which limit the output of one investment through a failure to provide other supporting infrastructure.

For many of the region's countries the main source of funds for infrastructure development is, and will

¹ ESCAP, *Annual Report (E/1993/36, E/ESCAP/327)*, paras 532 and 533.

continue to be, domestic finance. In this respect, there is appreciable room for greater tax efforts, in particular, the current degrees of buoyancy and elasticity of the tax system can be much enhanced through a judicious widening and deepening of the tax base. Fiscal instruments can be better designed and innovations, such as value added taxation, can be more widely introduced in accordance with the available administrative capabilities.² Moreover, the assignment of additional resources to minimize tax avoidance and ensure greater compliance will likely yield high returns.

It also appears possible to raise non-tax revenue, rationalize demand, improve delivery efficiency and enhance equity of access through higher fees for infrastructure users or charges on beneficiaries across a wide range of infrastructure facilities and services. This would be consistent with self-financing of infrastructure projects.

The encouragement of a greater involvement by the private sector in infrastructure development is a feature of current policies in a number of countries of the region. In many cases, this represents a solution to some of the problems arising in infrastructure development, including the provision of funds from outside the government budget, implementation of efficiency measures and transfer of technology and management know-how. For some countries, however, it has been difficult to attract the private sector. In this respect, the key policy issue which needs to be addressed is the creation of a favourable climate for private sector participation. Such a "climate" is multidimensional and includes the ability of the country's legal system to accommodate and facilitate both domestic and foreign private sector participation, the Government's administrative procedures in relation to the formation and operation of private organizations and the general macroeconomic stability of the country.

In the case of the least developed countries, there is a clear need for the international community to continue providing support. In many cases, this will

require a reassessment of long-term strategies for sustainable development so that donors and recipients can work together towards this end.

For the disadvantaged economies in transition and economies which have recently emerged from periods of extended civil strife, there is a major rehabilitation and reconstruction task at hand, which also demands the attention of the international community.

For many countries of the region, especially the land-locked countries, the provision of an efficient transport system is essential for the development of a country's trade. This requires a number of different modes of transport, transit through third countries and across borders. The very nature of these requirements dictates that a regional, integrated systems approach is adopted towards the development of infrastructure, multimodal transport, transit arrangements and facilitation of border crossings. Similarly, the joint development of infrastructure projects can be mutually beneficial to the countries concerned and, for example, in the power sector, can provide the basis for further economic development.

There are considerable differences in the stages of economic development which countries of the region have reached, and many countries have adopted different approaches to the provision of infrastructure facilities. Consequently, there is a firm basis for the sharing and comparing of experiences in infrastructure development and mutual assistance in human resources development through regional economic cooperation.

It would appear that by the end of the century there will still be a considerable shortfall in infrastructure capacity. To minimize the impact of this, the majority of initiatives need to be taken at the national level in terms of improving the efficiency of existing systems, mobilizing domestic resources through improved fiscal measures, self-financing and creating the environment for the private sector to contribute to the development process. To this end, a number of recommendations have been made for action at the country level and supportive action at the regional level.

² Various forms of value added taxation have been introduced in several countries of the region.

INTRODUCTION

1. Background to the theme study

In a number of ESCAP member countries, power brown-outs or black-outs, water shortages, traffic congestion in major cities, limited road access to provincial capitals at certain times of the year, long waiting times at major ports, and inadequate telecommunications services, including long waiting lists for telephones, can be observed. These are all symptoms of the inadequate supply or management of infrastructure facilities. They are also manifestations of more deeply rooted problems and have a direct impact on domestic and international trade which in turn affect a country's growth and the welfare of its citizens. They form part of a range of obstacles to a country's growth and trade which includes such items as an inadequate trade financing system, excessive costs of financing, complicated distribution systems with excessive incidental fees, inconsistent exchange rate policies, bureaucracy and red tape¹.

Many of the causes of these problems and obstacles can be directly traced to the Government's management of the macroeconomy, the means by which the public sector is administered, lack of coordination between, and overlapping responsibilities of, different ministries and agencies and the efficiency with which government agencies (including public enterprises) operate, both at the planning and day-to-day operational level.

Where the principal contributory cause of the above observations is the inadequate supply of infrastructure, many Governments are experiencing difficulty in finding or allocating adequate resources to undertake the necessary investment.

With these financial constraints as well as institutional weaknesses, many Governments are now pursuing the development of infrastructure projects by private sector participation.

Partially in response to some of these observations, the Commission at its forty-ninth session, held in Bangkok in April 1993, decided that the theme for its fiftieth session should be "Infrastructure development as key to economic growth and regional economic cooperation". The Commission's directive was as follows:

"The Commission observed that a major impediment to economic growth that was emerging or intensifying in most developing countries of the region was the deficiency in infrastructure (power supply, telecommunications; and transport, including roads, rural roads, railways and ports). It stressed that if that problem could be solved trade and investment would be stimulated and regional economic cooperation enhanced. The Commission, accordingly, decided that the theme topic for the fiftieth session of the Commission should be "Infrastructure development as key to economic growth and regional economic cooperation". The Commission directed that in its study on the theme topic the secretariat should, *inter alia*, focus on an assessment of the magnitude of the deficiency in the physical infrastructure facilities in the developing countries, as well as in the disadvantaged economies in transition of the region, on the resources required for addressing that deficiency and on the measures needed to attract private investment, both domestic and foreign, for establishing infrastructure facilities. The successful experience of countries in the region in attracting private investment in infrastructure development facilities, as well as the policies needed for efficient management of infrastructure facilities, should also be utilized. In the promotion of increased investment for infrastructure building, the sustainability of development should be taken into account. The study should also focus on areas in which regional cooperation could facilitate the establishment of infrastructure facilities."²

¹ ESCAP/United Nations Development Programme, *Empirical Study of Trade and Investment within the Asia-Pacific Region* (ST/ESCAP/1184), 1992.

² ESCAP, *Annual Report* (E/1993/36, E/ESCAP/927), para 533.

2. The scope of the infrastructure included in the study

The *Economic and Social Survey of Asia and the Pacific 1990*, in part two, "Infrastructure development in the developing ESCAP region: needs, issues and policy options", made distinctions between physical, social and institutional infrastructure. Physical infrastructure included the energy supply network, transport and communications, and agricultural infrastructure. Social infrastructure included health, education, water supply and housing. Institutional infrastructure included financial institutions, management of public enterprises, management of regulatory mechanisms and non-governmental institutions. It was recognized that although there was considerable overlap between these types of infrastructure, the categorization was made on the basis of the primary objective for which the infrastructure was intended. In the case of physical infrastructure it was largely used as an input in the production process.

The Commission's directive for its fiftieth session identified physical infrastructure as the main area of focus, while specifically mentioning power supply, telecommunications, and transport, such as roads (including rural roads), railways and ports. This study adopts the 1990 Survey definition of physical infrastructure, being that required for the production process. The sectors considered therefore include the following:

- (a) Power supply (generation and distribution);
- (b) Water supply and waste water treatment;
- (c) Telecommunications;
- (d) Transport (airports, inland waterways, ports, railways and roads).

In terms of water supply the study covers domestic water usage, waste water and agricultural water supply, in addition to water used in the production

process. This approach has been followed because common reservoir sources and delivery systems are used for both domestic and industrial water usage. It would not be meaningful to address water supply infrastructure requirements and development only in terms of usage in productive processes. There can also be a hydroelectric power dimension to water supply development, and vice versa.

3. Organization of the report

This study is divided into six chapters. Chapter I investigates the demand for financial resources by assessing the magnitude of the deficiency in the physical infrastructure facilities and the resources required for addressing that deficiency. Chapter II investigates the supply of financial resources by looking at the domestic and foreign resources available. The principal conclusions of chapters I and II are that the financing requirement is enormous and it is unlikely that the financial resources required will be available. There is, however, considerable scope to reduce the financing requirement through more efficient management of infrastructure facilities. In this respect, chapter III of the study looks into the management aspects of all of the infrastructure subsectors considered in chapter I (with the exception of airports).

Chapter IV considers infrastructure investment from the private sector's perspective along with the modes of investment and the measures for attracting private sector participation. Chapter V outlines the important role that regional cooperation can play in the development of the region's infrastructure.

The final chapter collects together the main issues arising in both this study and part two of the 1990 Survey "Infrastructure development in the developing ESCAP region: needs, issues and policy options". The chapter also provides a set of recommendations at the country and subregional/regional level.

Chapter I

THE PHYSICAL INFRASTRUCTURE DEFICIENCY AND DEVELOPMENT FUNDING GAP

This chapter examines, both at the individual infrastructure and aggregate levels, the physical deficiencies in power supply, water supply and waste treatment, telecommunications and transport infrastructure and the investment resources required to address that deficiency through to the year 2000.

A. METHODOLOGY FOR ESTIMATING DEFICIENCIES

From the Commission's directive, the secretariat identified the primary areas to be investigated in the study as the magnitude of the deficiency in physical infrastructure facilities to the end of the century, the resources required for addressing that deficiency, and ways of providing those resources needed to address the deficiency, including approaches to improving the efficiency of existing infrastructure thereby reducing the shortfall, and measures needed to attract domestic and foreign private investment.

1. The intended approach

It was recognized that the first task to be undertaken in the study was to identify the increment in infrastructure required between a base year and the target year. In principle, that could be done by estimating the existing capital infrastructure and the demand for the corresponding facilities in a base year, projecting the demand through to the target year and converting this demand into the required capital. The difference between the capital in the base and target year would represent the required increment in capital. The second task was to deduct from that increment projects underway or committed. The remainder would represent the deficiency or 'gap' in infrastructure facilities. Whilst this methodology has a number of shortcomings, it does provide an indication of the magnitude of the deficiency in physical infrastructure facilities.

To obtain the data necessary for the study, a plan was devised consisting of a questionnaire sent to

the 36 member countries of ESCAP, special focus country studies (to be undertaken by nominees of member countries on a consultancy basis), and back-up desk studies at the secretariat. In the event, fourteen questionnaires were returned, of which only three contained sufficient data for further processing, and severe cuts at the United Nations in funding for travel and recruitment of consultants meant that the planned country studies did not proceed. A key item in the questionnaires covered details on countries' forward plans and estimated infrastructure requirements. The inability of most countries to be able to supply data on basic infrastructure and forward needs provides some reflection on the inadequacy of national information systems and the level of infrastructure planning.

2. The approach used

In the face of the lack of data from member countries, the secretariat developed deficiency and gap estimates based mainly on desk research using data available within the secretariat.

Where adequate and relevant time series data were available for infrastructure, sector projections were made of demand to the year 2000 taking into account growth rates in the period 1980-1990, projected population growth rates over the period 1990-2000, and sector specific indicators such as increases in power consumption per capita, telephone lines per capita and decreases in population per kilometre of road length. In the process of converting demand into capacity required, efficiency improvements were also taken into account where possible (for example, reductions in transmission losses, improvements in rail productivity and improvements in cargo handling productivity at seaports). This approach was broadly used for the power, water supply, telecommunications, rail, road, and seaport (container) sectors.

In the absence of information on the urban transport and airport sectors reliance was necessarily based on literature searches to identify

¹ The five-year plans of many countries provide some data on resources allocated to the infrastructure subsectors. On average, countries are half way through the current plan and consequently these data only go through until 1995. In addition, they show the allocation of resources from a finite budget, not the need for infrastructure.

major projects in the planning or proposal stage and to use these known projects to estimate funding requirements.

3. Limitations of the methodology

It is considered that the methodology utilized results in significant underestimation of the regional infrastructure deficiency and resource requirements for a number of reasons:

- (a) The estimates concentrate exclusively on infrastructure increments required over and above existing assets without any regard for the status or condition of those existing assets. In many countries in the region the existing infrastructure is severely depleted or outdated and comprehensive rehabilitation programmes are required. A fuller investigation would be needed to determine the extent of this deficiency and the resources required to address it;
- (b) Where a country either did not have a particular infrastructure (for example, there are no railways in the Lao People's Democratic Republic) or the secretariat did not have detailed information on it (for example, railways of the Central Asian republics) the methodology does not recognize a deficiency or provide for infrastructure development resources;
- (c) Estimates of future demand for infrastructure have in many cases been based on historical growth, whereas for some countries accelerated growth is anticipated for the 1990s and therefore underestimates of demand arise. Such underestimation could be substantial for countries with a large population, such as China, or for countries at a low development base, such as Viet Nam. Of course, where growth rates decline overestimates would have occurred;
- (d) In measuring the funding gap for some infrastructure subsectors, for example, roads, it was necessary to assume that government funding would continue to be forthcoming to support projections of past growth in road lengths.

4. Country level analysis

Rather than concentrating on specific countries, the report aims to examine the level of the deficiency in infrastructure, in aggregate and by sector, across the region as a whole and estimate the resources required to redress that deficiency. Where appropriate brief discussions focus on specific country needs.

B. THE PHYSICAL INFRASTRUCTURE DEFICIENCY AND RESOURCE GAP IN SUMMARY

Table 1.1 below shows the estimated increment in physical infrastructure facilities required between a base period of 1990-92 and the year 2000 for ESCAP member countries excluding Australia, Japan and New Zealand (airports and urban public transport were estimated on a financial basis only and consequently are not shown). Table 1.2 provides an estimate of the financial resources required for those infrastructure facilities over the same period and table 1.3 shows the investment requirement by subregion.

The estimated total funding required to the year 2000 for identified additional infrastructure is approximately \$1,400 billion, of which up to \$500 billion was identified as available or already committed. The financial resource gap therefore amounts to \$900 billion. To put this in perspective, the combined lending in 1992 of the World Bank and the Asian Development Bank (ADB) was around \$27 billion, of which \$7.5 billion was on transport, telecommunications, energy, urbanization and water supply and sanitation. If similar amounts were lent each year for the next eight years to the year 2000 it would amount to a total of \$60 billion or 6.7 per cent of the identified additional financial resource requirement.

The sector placing by far the highest demand on funds, in terms of additional financial resources, is the power sector with a requirement for \$472 billion, followed by water with \$149 billion and telecommunications with \$110. Railways, roads and urban public transport have a requirement for between \$43 and \$57 billion each, while the requirements for the remaining two sectors are \$40 billion for airports and \$7 billion for seaports.

Table 1.1 Estimated required increment in selected physical infrastructure facilities

<i>Infrastructure type</i>	<i>Existing 1990/92</i>	<i>Required 2000</i>	<i>Increment</i>
Power supply			
– generating capacity (gigawatts)	350	680 to 740	330 to 390
Telecommunications			
– main telephone lines (thousands)	48,200	136,700	88,500
Railways			
– track length (kilometres)	222,800	264,000	41,200
– locomotives (number)	23,300	30,200	6,900
– freight wagons (number)	737,600	833,000	95,400
– passenger cars (number)	76,000	105,400	29,400
Roads			
– length (thousands of kilometres)	4,850	6,860	2,010
Seaports			
– container berths (number) ¹	233	374	141

Source: ESCAP secretariat estimates.

Note: 1. The figures include container berth requirements in developed member countries.

**Table 1.2 Investment resources required for infrastructure development
to the year 2000
(billions of US dollars)**

<i>Infrastructure type</i>	<i>Investment required</i>	<i>Investment gap</i>
Power supply	576 to 634	401 to 472
Water supply and waste treatment	258 to 298	129 to 149
Telecommunications	133	110
Railways	78	43
Roads	162	45
Urban transport	68	57
Airports	45	40
Seaports	26	7
Total	1,346 to 1,444	832 to 923

Source: ESCAP secretariat estimates.

Table 1.3 Total investment resources required for infrastructure development to the year 2000, by subregion (billions of US dollars)

<i>Infrastructure type</i>	<i>Central Asia</i>	<i>South Asia</i>	<i>South-East Asia</i>	<i>East Asia</i>	<i>Pacific islands</i>	<i>Asia and the Pacific</i>
Power supply	80	136	83	334	1	634
Telecommunications	8	37	32	55	0	132
Railways	1	15	1	61	0	78
Roads	5	47	64	45	1	162
Urban transport	0	3	13	52	0	68
Airports	0	1	15	29	0	45
Seaports	0	4	6	15	0	25
Water supply and waste treatment	n.a.	n.a.	n.a.	n.a.	n.a.	298
Total	94	243	214	591	2	1,144

Sources: ESCAP secretariat estimates.

Note: There are slight differences in the totals in tables 1.2 and 1.3 because of rounding.

Resource requirements on a country basis show, perhaps not unexpectedly, that the region's most populous countries, namely China and India have the largest funding requirements. In the power sector, for example, it is estimated that China requires an additional 124,000 megawatts (MW) and India an additional 74,000 MW of capacity. Together these countries represent 57 per cent of the ESCAP region's incremental investment requirement. Similarly, almost half of the additional road infrastructure requirements are in India. In urban public transport, the metro projects of the Republic of Korea dominate the sector with a massive requirement for \$31 billion. For airports, 57 per cent of the required funding is in five of the region's seven major hubs of Bangkok, Hong Kong, Singapore, Seoul-Kimpo, and Taipei.

Analysis shows that \$25 billion, of the incremental investment required in transport and communications (i.e. excluding the power and water sectors) through to the year 2000 will be made in the least developed countries and disadvantaged economies in transition (although the above note on the limitations of the methodology should be especially taken into account for those economies).

C. ELECTRICAL POWER SUPPLY

For the period 1980-1990 the growth in electricity consumption has risen by an average annual rate of 8.5 per cent. For developing countries of the

ESCAP region elasticities of electricity consumption with respect to gross domestic product (GDP) growth are in the range of 1.5 to 3.0². These high growth rates which are expected to be sustained in future years have caused planning problems: a 9 per cent growth rate means a doubling time of only 8 years, which is less than the lead times (including the feasibility studies, loan negotiations, design, engineering, construction and commissioning) for most power projects, with the exception of gas-fired power plants.

1. Regional electricity consumption

Electricity consumption in the developing economies of the ESCAP region for 1990 was 382 kilowatt hour (kWh) per capita¹ compared with the 6,900 kWh per capita consumed annually in

² The more advanced economies had lower elasticities (Republic of Korea 1.2 and Thailand 1.46) and the less advanced economies had higher elasticities (India 1.51 and Indonesia 2.9). The exception was China which had an elasticity of 0.85 for the period.

³ The electricity data used in this report have been taken from the ESCAP biennial series *Electric Power in Asia and the Pacific*. The developing ESCAP region here encompasses those countries and economies included in the latest issue of the series: *Electric Power in Asia and the Pacific, 1989 and 1990* (United Nations publication, Sales No. E.93.II.F.18). It does not include Taiwan Province of China, other developing countries or economies not responding to the ESCAP questionnaire survey (Brunei Darussalam, Maldives, Viet Nam, and some Pacific island countries), and others not yet included in the survey at the time, namely Cambodia, Democratic People's Republic of Korea and the Central Asian republics.

Organisation for Economic Cooperation and Development (OECD) countries. However, there is significant variation between countries in the region on per capita consumption. A small number of developing economies, while below the OECD demand level, still have high per capita consumption compared to other economies in the region. Such economies include Guam (9,122 kWh), Singapore (5,247 kWh), Hong Kong (4,575 kWh), and Republic of Korea (2,202 kWh). These economies only cover 1.9 per cent of the regional population but account for 13.1 per cent of regional electricity consumption.

At the lower end, per capita consumption in Afghanistan, Bangladesh, Cambodia, Lao People's Democratic Republic, Myanmar and Nepal was less than 50 kWh. Additionally these countries are among the lowest in terms of population access to electricity. According to ADB, in 1990 electricity was only available to 6 per cent of the population in Afghanistan, 6 per cent in Myanmar, and 9 per cent in Nepal. Comparative figures for some other countries and areas are 24 per cent for Indonesia, 37 per cent for Pakistan, 61 per cent for the Philippines, 71 per cent for Thailand, 80 per cent for India, and 100 per cent for both Hong Kong and Singapore⁴.

On a region-wide basis 61 per cent of electricity is consumed in the industrial sector and only 18 per cent in the household sector. In terms of the number of subscribers, however, 77 per cent are households and only 2.8 per cent are industries.

2. Regional generating capacity and power generation

The total installed generating capacity in the developing economies (excluding the Central Asian republics) in 1990 was around 320,000 MW⁵. The developing countries rely mainly, to the extent of about 70 per cent, on coal as a source of power generation. Hydropower plants are a distant second, and oil comes third. This is because the two countries with the largest generating capacity, China and India, have large coal reserves which they use for power generation. The other developing economies of the region have much less access to their own coal resources and, in the

absence of hydro-potential, have to rely on imported fuel, usually oil, because of its convenience, lower handling costs and availability. If natural gas is domestically available, then it automatically becomes the first choice as fuel for power generation. Besides being a clean fuel, it is convenient to handle, quick to install and can be used in a wide range of power plants (anywhere from 10 to 1500 MW).

For economies with large power systems, such as larger than 10,000 MW with the largest unit greater than 300 MW, coal is the cheapest fuel for power generation⁶ and is readily available in the international market. For smaller power systems with units in the range of 50 - 200 MW, oil is the preferred fuel because of its availability, convenience and lower handling costs. Hydropower and geothermal power plants are available only at specific sites. There is considerable hydropower potential still unutilized, but its exploitation is meeting increasing environmental concerns.

Total electricity generated in the developing ESCAP region in 1990 was around 1,337,000 gigawatt hour (GWh), of which 78 per cent was sold to consumers⁷. The balance of production is accounted for mainly by internal usage within generating stations (5.8 per cent of generation) and by transmission and distribution (T and D) loss (estimated to be around 10.8 per cent over all developing economies in the ESCAP region). The estimated growth rate in electricity generation in those countries during the 1980s was 9.0 per cent a year, which may be compared with the calculated annual growth rate in electricity generation for the developing member countries (DMCs)⁸ of ADB at 8.5 per cent a year for the same period.

⁵ Nuclear power could only be contemplated in units higher than 400 MW. Because of its much higher capital costs (even though its fuelling costs are much lower) nuclear power could be competitive with coal only if a series of power plants were built. If only one plant were built it could not be competitive against coal.

⁷ Gross generation was 1,337,046.9 GWh and consumption (sales) was 1,036,872.8 GWh, whereas transmission and distribution (T and D) losses and other use was 144,275 GWh. Auxiliary use was 77,627 GWh. As noted under footnote 3, these figures for 1990 do not include the Central Asian republics. If these economies were included the corresponding figures for 1990 would have been installed capacity of about 350,000 MW generating 1,532 terawatt hour (TWh). The corresponding ADB figures (from publication in footnote 6) for ADB developing member countries are 300,299 MW and 1,302 TWh.

⁸ The main difference in regional coverage between ADB and ESCAP is that ADB does not encompass the Islamic Republic of Iran and the Central Asian republics.

⁴ Asian Development Bank, *Electric Utilities Data Book for the Asian and Pacific Region*, (Manila, January 1993). Further consultations with ADB were undertaken in preparing this study.

⁵ See footnote 3 for definition of ESCAP developing economies.

The extent to which the generating capacity of any country is adequate to meet the production requirements will be dependent on a number of factors, including the successful implementation of programmes and plans for additional capacity, the efficiency of the generation, transmission and distribution machinery and equipment, and the spatial and time distribution of power demand. Most countries, however, are facing a situation of suppressed demand, arising out of their utilities' inability to meet all of the demand adequately. Fluctuations in the daily load may be high because of uneven demand. In addition, in some countries lack of maintenance or merely the ageing of generating machinery has resulted in a reduction of the effective operating capacity. Additionally, hydroelectric power stations may not be used to full capacity consistently over the year because of seasonal conditions and may be severely restricted in times of drought. Transmission and distribution losses are high: out of 26 countries submitting 1990 data on transmission and distribution losses and own use (T & D loss + own use), 12 countries showed less than 10 per cent and only 4 countries experienced between 10 and 15 per cent. However, 4 countries were in the 15 to 20 per cent category, 3 countries were in the 20 to 25 per cent category and 3 countries had higher than 25 per cent⁹.

3. Year 2000 power generation requirements

Projections of required capacity based on historical data of electricity consumption along with estimates of future transmission and distribution losses, as well as own use, are in the range of 679 - 735 GW (3,000 - 3,230 TWh) for the Asian and Pacific developing economies. This would meet an energy demand of 2,580 - 2,800 TWh.

It may be noted, however, that this projection is likely to be in the lower range of the expected "real" requirements, because of more favourable developments in economic reforms and economic restructuring in East Asia, South-East Asia, Central Asia, and South Asia.

It is to be noted that the projections may be compared with the ADB projected figure of 536.336 MW and 2,192.5 TWh by 2000 for its developing member countries¹⁰; also with a previous World

Bank study for the decade 1989-1999 (for Asian developing countries) which gave 493 GW and 2,900 TWh (generation + net imports) by 1999¹¹.

Table 1.4 below shows the projected year 2000 power generation requirements of the developing economies of the ESCAP region, including the Central Asian republics. Overall there would need to be an increase of about 96 - 111 per cent in electricity generated regionally, from 1,532 terawatt hour (TWh) in 1990 to 3,000-3,230 TWh in 2000.

4. Capacity development and investment implications

The cost of developing power infrastructure varies significantly depending on the energy source, manufacturing technology, labour costs, site conditions etc. Thermal power station based development costs are of the order of \$1 million per MW for plants using imported equipment. The costs of thermal plants with mostly endogenously manufactured equipment would be less, of the order of \$600,000 - 800,000 per MW. Hydroelectric schemes are site-specific and could be significantly more capital intensive but incur lower long-term operating costs because of the absence of fuel costs. For the purposes of this study the average cost of the supply of electrical power generation and supporting transmission and distribution infrastructure has been estimated at \$1.75 million per megawatt at 1992 prices. However, country specific figures have been used in the estimation of the investment requirement. This compares with a 1990 World Bank costing of \$1.94 million per megawatt and a 1993 ADB figure of \$2.12 million.

On this basis it is estimated that \$576 - 674 billion will be required for the supply of electrical power infrastructure in the developing economies of the ESCAP region between 1990 and 2000. This figure compares with a recent ADB estimate of investment requirement of \$500 billion for power supply infrastructure over the same period for its DMCs. The ADB estimate assumes a fall-off in annual power generation growth to between 5 and 6 per cent in 1990-2000 from the 8.5 per cent experienced in 1980-1990. This may be compared with the ESCAP assumption of 6.3 - 7.2 per cent demand growth for the region, falling only slightly from 8.0 per cent during the period 1980-1990. It should be noted that ADB in making their estimates assumed a higher unit cost per MW.

⁹ The Asian Development Bank provides a figure of 16.5 per cent overall system losses for its developing member countries in 1990.

¹⁰ Asian Development Bank, *op. cit.*

¹¹ ESCAP, *Prospects for Efficient Utilization and Load Management in Electric Power Utilities*, (NR/PCESD/7), the figures being based on a World Bank compilation of developing country utilities' plans for 1989-1999.

Table 1.4 Electricity consumption and capacity scenarios to the year 2000

	<i>Consumption (gigawatt hour)</i>					<i>Capacity (megawatt)</i>		
	1980	1990	2000		2000			
			(1)	Range	(2)	(1)	Range	(2)
East Asia	358,016	776,027	1,459,326	–	1,600,127	346,716	–	380,498
South-East Asia	51,077	132,179	308,362	–	331,233	85,604	–	92,192
South Asia	109,325	268,299	546,005	–	574,529	180,257	–	189,764
Central Asia	124,315	215,287	261,824	–	288,660	65,456	–	72,165
Pacific islands	750	1,149	1,701	–	1,890	773	–	859
ESCAP region	643,483	1,392,941	2,577,218	–	2,796,439	678,806	–	735,478

Source: ESCAP secretariat estimates.

Note: (1) and (2) refer to low and high scenarios.

The three largest contributors to the ESCAP estimate are China (\$143 - 181 billion for 102,000 - 129,000 MW), India (\$83 - 92 billion for 55,000 - 61,000 MW), and the Republic of Korea (\$42 - 46 billion for 22,000 - 24,000 MW). These three countries account for nearly 50 per cent of the total investment requirement.

No comprehensive or reliable information is available on the total level of funding already committed or utilized in the region since the beginning of the decade. However, it is estimated that \$173 - 202 billion has already been committed or utilized and that \$401 - 472 billion still has to be found between 1994 and 2000.

5. Selected countries: power planning and projects

In a number of countries within the region in recent years, imbalances have emerged between electricity supply and demand, thereby resulting in power shortages and disruption to both industry and other consumers. In some cases rapid economic growth has simply seen demand outstrip supply. In other cases the poor performance of existing infrastructure has been a critical factor. India and the Philippines are two countries where such power problems have arisen.

The Philippines has experienced power shortages since 1989, and in 1992 daily brown-outs of up to 12 hours duration were experienced in the peak demand summer months. The power shortfall has been attributed to the impact of below average

rainfall on hydroelectric reserves, frequent breakdowns in existing facilities and slowness in the development of new projects largely owing to environmental concerns.¹²

The latest Philippines Five-year Plan (1993-1998) has set targets of eliminating daily "brown-outs" by the end of 1993 and totally by the end of 1996. These objectives would be achieved with the installation of 6,184 MW of additional generating capacity. At the same time distribution losses would be reduced from 20.8 per cent to 17.8 per cent, introduction of a single new power grid would also provide greater flexibility in power distribution, and 17 existing power plants with a total capacity of 1,685 MW would be rehabilitated. Total expenditure in excess of \$8.4 billion is envisaged.

The Indian Government Planning Commission's Eighth Five-year Plan covering the period 1992 to 1998 envisaged the introduction of 25,000 MW of new generating capacity. The Planning Commission has reportedly announced that even with an increase in generating capacity of 30,500 MW over the five years to March 1997 (an increase of 45 per cent over the 1990 installed capacity) there would be no change in the current position where power demand exceeds supply by 20 per cent at peak demand times.

¹² One striking example relates to the nuclear power plant project which was completed in 1986 but has never been operated. Attempts to bring it to the commissioning stage have not succeeded thus far. The removal of a 600 MW unit from the Luzon grid in 1986 resulted in an instantaneous shortfall of 600 MW from which the National Power Corporation is only now recovering.

The Government of India is currently examining a range of 41 power projects proposed by the private sector which would collectively add 20,000 MW to the country's generating capacity at a cost of \$16.5 billion.

D. WATER SUPPLY AND WASTE TREATMENT

Although most countries of the Asian and Pacific region seem to have ample water resources to meet rising demand, adequate quantities may not be readily available in the places where it is needed, nor at the time of greatest demand. It has been estimated that at the beginning of the 1990s the total annual water abstraction in the ESCAP region was in the order of 1,500 billion cubic metres. In all countries of the region, except Singapore, the bulk of water is withdrawn for agriculture. The share of water abstracted for agriculture varied from about 95 per cent in the still predominantly agricultural economies of Bangladesh, Cambodia, Nepal and Pakistan to around 64 per cent in the more industrialized economy of the Republic of Korea. In China and India, agricultural use takes about 83 to 85 per cent of the total water supply. At the beginning of the 1990s it was estimated that 85 per cent of the volume of water abstracted for the region as a whole was for the agriculture sector. Domestic and industrial uses were estimated as 7 and 8 per cent respectively.

1. Regional water consumption

Present annual rates of total water abstraction for domestic, industrial and agricultural purposes are estimated as 105, 120 and 1,275 billion cubic meters respectively. In urban households with piped water, daily use typically ranges from 100 to 400 litres per day. In rural areas of the developing countries, the per capita use averages from 40 to 60 litres per day, while in some least developed and small island countries the level of water usage may be close to the biological minimum (from 2 to 5 litres per person per day) during the dry season.

According to the report on the achievements of the International Drinking Water Supply and Sanitation Decade (1981-1990), July 1990, by the Economic and Social Council, it is estimated that out of 1,347 million people globally who, for the first time, received adequate water supply services during the Decade, 80 per cent lived in Asia and the Pacific - 896 million in rural areas and 185 million in urban areas. Of the global access to sanitation services

the population of the ESCAP region represents 68 per cent of the total.

2. Trends in water demand

In recent years, there has been growing pressure on water resources in many countries of the region, with increasing demand from the agricultural, domestic and industrial sectors. Table 1.5 presents changes in the volumes of water used by these sectors over the years with projected estimates for the year 2000.

Although agriculture is by far the largest water consumer in the majority of countries in the region, agricultural water usage is normally accorded a lower government priority than domestic/industrial usage. At times of water shortage, for example, agricultural water supplies are cut to ensure adequate supplies to domestic/industrial usage.

3. Projecting year 2000 water supply requirements

According to available estimates, the number of people in urban areas of the ESCAP region served with water supplies in 1990 was 586.11 million, and the total urban population is expected to reach 1,085.56 million by the year 2000. Similarly, the number served in rural areas was 1,406.60 million in 1990, and the total rural population is expected to reach 2,320.79 million by the year 2000. The number of potential additional recipients of urban water supply services between 1990 and 2000 is, therefore, 499.45 million while for rural areas the estimate is 914.19 million persons.¹³

Agenda 21, in its chapter 18 on freshwater resources, part E, states that:

"18.58 All States, according to their capacity and available resources, and through bilateral or multilateral cooperation, including the United Nations and other relevant organizations as appropriate, could set the following targets:

- (a) *By the year 2000, to have ensured that all urban residents have access to at least 40 litres per capita per day of safe water and that 75 per cent of the urban population are provided with on-site or community facilities for sanitation;*

¹³ Report of the Economic and Social Council (A/45/327), "Achievements of the International Drinking Water Supply and Sanitation Decade 1981-1990", (July 1990).

Table 1.5 Selected countries of the ESCAP region: water usage and projections for the year 2000

	<i>Water use (billion cubic metres)</i>				
	1975	1980	1985	1988-1990	2000
India				(1990)	
Domestic	11 ¹			25 ²	33 ²
Industry	15			34	57
Agriculture	354			460	630
(other)				33	30
Total	380			550	750
Japan				(1988)	
Domestic	12.3 ³	13.7 ³	15.1 ³	15.7 ³	20.8 ⁴
Industry	18.3	16.5	15.6	15.4	22.2
Agriculture	57.0	58.0	58.5	58.5	62.6
Total	87.6	88.2	89.2	89.6	105.6
Thailand ⁵				(1989)	
Domestic		0.79	1.13	1.51	3.90
Industry		0.94	1.19	1.44	2.34
Agriculture		18.80	25.50	30.20	38.48
Total		20.53	27.82	33.15	44.72
Viet Nam ⁶				(1990)	
Domestic		1.32	1.75	2.00	2.92
Industry		1.50	2.87	5.33	15.99
Agriculture		35.04	40.65	47.00	60.47
Total		37.86	45.27	54.33	79.38

Sources: See notes below.

- Notes:
- ¹ The World Resources Institute, *World Resources, 1992-93* (Oxford University Press, 1992).
 - ² M.S. REDDY, Member, Central Water Commission, Government of India, *Country Paper, ICWE* (Dublin, January 1992).
 - ³ *Water Resources in Japan, 1990*.
 - ⁴ Japan's National Comprehensive Water Plan (Water Plan 2000).
 - ⁵ ESCAP, *Assessment of Water Resources and Water Demand by User Sectors in Thailand*, Bangkok, 1991. The estimates exclude private, rural water supply systems and industrial private water supply systems.
 - ⁶ Pham Xuan, SU, Institute for Planning and Management of Water Resources, Viet Nam, *Water Resource, Status of Pollution and Water Use in Viet Nam*, presented at the Mekong Water Quality Monitoring and Assessment Expert Group Meeting, Bangkok, 29-30 November 1993.

- (b) *By the year 2000, to have established and applied quantitative and qualitative discharge standards for municipal and industrial effluents;*
- (c) *By the year 2000, to have ensured that 75 per cent of solid waste generated in urban areas is collected and recycled or disposed of in an environmentally safe way "*

In the review of the achievements of the Decade, it was declared that in Asia and the Pacific the percentage of people provided with water supply in 1990 was 77 per cent of the total urban population (up from 73 per cent in 1980) and 67 per cent of the total rural population (up from 28 per cent in 1980).

According to the projections made in the review, if the physical rate of supply connection achieved in the decade 1980-1990 was maintained up to the year 2000, then coverage rates at the year 2000, after taking population growth into account, would be of the order of 71 per cent of the urban population and 99 per cent of the rural population.

For the purposes of this study it has been decided to set targets of 85 per cent coverage in both urban and rural populations of the region for the year 2000. The setting of targets at this level reflects the level of progress required to achieve full coverage in 2025 given that the region is already well on the way to meeting the Agenda 21 coverage objective of 75 per cent for the year 2000.

In 1990, the sanitation coverage was 65 per cent in urban areas and 54 per cent in rural areas. In order to provide 75 per cent service coverage in both urban and rural areas, it would be necessary to serve 319.4 million additional persons in urban areas and 606.91 million additional persons in rural areas between the year 1990 and 2000.

Owing to the uneven growth of industries within the region and to the variations in specific water requirements, the projections for the water demand by the industrial sector is rather difficult. For instance in a few highly industrialized countries in the region, the demand for water by industry has reached a plateau mainly because of higher efficiency in production processes as well as increased rates of water recycling and reuse. However, in some developing countries water demand for power production, manufacturing, mining and material processing are rising in conformity with the industrialization path. Therefore, a safe estimate for growth of demand for

industrial water supply would be in the order of 5-10 per cent annually over the period 1990-2000 equating to 6-12 billion cubic meters of water a year.

According to the Food and Agriculture Organization of the United Nations (FAO) sources, the average annual growth rate of irrigated areas in Asia and the Pacific region was in the order of 1.1 per cent during the period 1980-1990. It is expected that this rate will continue until the year 2000. Further increases in yields and production in the region are expected to come from increased efficiency and more rational use of water on existing irrigated land, achieved particularly through rehabilitation of degraded and debilitated irrigation systems. It is estimated that in most irrigation schemes only about 40 per cent of water taken into major canals reaches the fields. It is estimated that about 16 million hectares of newly irrigated area could be developed and 35 million hectares rehabilitated during the period 1990-2000.

4. Investment requirements

According to available data in 1985 prices¹⁴, the unit per capita cost of urban house connection varied from \$34 in the Philippines to \$170 in Sri Lanka. It was reported to be as high as \$200 in Papua New Guinea and \$320 in Samoa. Similarly, unit per capita cost of standpipe type urban water supply varied from \$1 in the Philippines to \$90 in Sri Lanka and \$100 in the Maldives.

The unit per capita cost of rural water supply systems varied from \$2 in Bangladesh to \$40 in the Republic of Korea. The cost varied from \$26 to \$160 in various schemes in Malaysia. In Samoa, it reached \$180.

From above it can be estimated that for the period up to year 2000, the unit per capita cost for urban house connections would be in the order of \$120, and for standpipes \$80. The unit cost for rural water supply is estimated as \$50.

Assuming that of the 336.62 million to be served in urban areas between 1990 and 2000, 90 per cent will have house connections and 10 per cent will be served by standpipes, the total cost reaches approximately \$43 billion. Similarly, the total cost for the provision of rural water supply for 566.07 million persons would be in the order of \$28 billion.

¹⁴ World Health Organization, *The International Drinking Water Supply and Sanitation Decade, Review of Mid-Decade Progress* (Geneva 1987).

These are the estimates at 85 per cent service coverage levels. Full coverage would cost much more and it would not be realistic that full coverage levels could be achieved by the year 2000, at the current development rates.

From the available information, it is estimated that sewer connections in urban areas could cost \$140 per capita and \$60 for other type of sanitation facilities. The unit cost of rural sanitation is estimated at \$40 per capita. Assuming that half of the urban population provided with services during the period 1990-2000 will use sewer connections, the total cost of urban sanitation reaches \$32 billion at 75 per cent service level. Similarly, the total cost for rural sanitation at the same service level will be \$24 billion.

According to the available data, the cost of production of water (in 1985 dollars) varied from \$0.02/m³ in China and \$0.08/m³ in India to \$0.21/m³ in Thailand and \$0.25/m³ in Myanmar and Sri Lanka. In the island countries, the water production costs were much higher, varying from \$0.09/m³ in Samoa to \$0.55/m³ in Papua New Guinea and \$0.80/m³ in Tonga.

Accepting an estimate of \$0.30/m³ for average water production costs, the total requirements for industrial water supply would be between \$18-36 billion for the period 1990-2000 in Asia and the Pacific to meet 6-12 billion cubic meters of annual water demand increase.

Industrial waste treatment costs could be about 25 per cent higher than the cost of water supply, requiring \$22-44 billion for the period 1990-2000.

The cost of water development for irrigation in the 1980s varied from \$2,000 per hectare in China and \$3,000 per hectare in Indonesia. Therefore, for the period 1990-2000, an average cost of \$3,500 per hectare would be a realistic figure. A total of \$56 billion would thus be required for the expansion of irrigated areas at the rate of 1.6 million hectares a year between 1990 and 2000. The average cost for upgrading and rehabilitation could be about \$1,000 per hectare. Accordingly, the total cost for upgrading and rehabilitation of water supplies for debilitated schemes totalling 35 million hectares could be estimated as \$35 billion.

The total expenditure on water supply and sanitation service coverage increases, between 1980 and 1990 in Asia and the Pacific, in both urban and rural areas is estimated at \$55 billion. The estimates for the period 1990-2000 can be

summarized as:

(a) Water supply and sanitation:	127 billion dollars
(b) Industrial water supply and waste water treatment:	40-80 billion dollars
(c) Irrigated agriculture:	<u>91 billion dollars</u>
Total	258-298 billion dollars

In addition to the above, about \$1.5 billion a year would be required for the operation and maintenance costs.

E. TELECOMMUNICATIONS

1. Telecommunications media

For the purposes of examining the status of telecommunications in the region this study focused on main domestic telephone lines. While facilities such as mobile phones, international lines and the level of technology of telephone services are all an integral and essential part of modern communications the relative number of main telephone lines provides perhaps the best indicator of the level of any country's telecommunications development.

The telephone main line information used in this study has for the most part been drawn from publications¹⁵ of the United Nations specialized agency for telecommunications, the International Telecommunication Union (ITU).

2. Telephone supply in the region

As at the end of 1991 the density of main telephone lines in the ESCAP region, excluding developed countries, was 1.6 main lines per hundred of population. This compares with a density of around 0.6 in 1982 (excluding the Central Asian republics for which no 1982 information was available). By comparison Australia, Japan and New Zealand had densities in 1991 of 46.4, 45.4 and 44.2 respectively.

¹⁵ International Telecommunication Union, *Asia-Pacific Telecommunication Indicators* (Geneva, May 1993).

¹⁶ International Telecommunication Union and Organisation for Economic Co-operation and Development, *Telecommunication Indicators of the Former Soviet Union* (Geneva, December 1992).

Within the region the developing economies with the highest densities in 1991 were Hong Kong (45.9), Singapore (39.9), Republic of Korea (33.7) and Brunei Darussalam (14). With the exception of Malaysia (9.9) and the Central Asian republics (8.2 as a whole), no other country with a significant population size exceeded 5.0 main lines per hundred population.

There has been significant growth in the number of main lines installed in recent years. Between 1982 and 1991 the number of lines in the region (excluding the Central Asian republics) increased by 12.1 per cent a year. Among the larger countries with high growth rates were China (15.3 per cent), the Republic of Korea (15.2 per cent), and Thailand (15.2 per cent). Smaller countries/ areas with high growth rates included the Maldives (18.1 per cent), Nepal (18.4 per cent), and Macau (21.3 per cent). Of the 19.9 million main lines installed in the region (excluding the Central Asian republics) between 1982 and 1991, China, India and the Republic of Korea, collectively accounted for 72 per cent, with the Republic of Korea alone, with only 1.5 per cent of the population accounting for over 37 per cent.

Despite the relatively high line densities of the Central Asian republics in 1991 (8.2 compared to 1.6 for the region as a whole) the rate of growth in those countries since 1982 has not matched the rest of the region with Azerbaijan experiencing 4.1 per cent, Kazakhstan 6.7 per cent, Kyrgyzstan 5.0 per cent, Tajikistan 3.4 per cent, Turkmenistan 4.5 per cent, and Uzbekistan 4.9 per cent a year.

3. Telephone demand in the region

Notwithstanding the high rate of installation of main lines in recent years the number of unmet applications for telephone lines has been rising steadily. Excluding the Central Asian republics the number of unmet applications rose between 1982 and 1991 from 3.7 million to 6.5 million. This represents an annual rate of increase of 6.7 per cent. This figure would be much higher if it were not for the efforts of the Republic of Korea which over the same period reduced its unmet applications from 427,000 to 192. Excluding the Republic of Korea and the Central Asian republics unmet applications in the region rose at an annual rate of 12.0 per cent.

Countries where the rate of increase of unmet demand was high included the Philippines where the number of unmet applications rose from 132,000 in 1982 to 705,045 in 1991 (an annual rate of increase of 20.5 per cent) and Thailand where unmet applications rose from 387,000 to 1,299,000 over the same period (a 14.4 per cent annual rate of increase).

Information on unmet demand for the Central Asian republics is only available from 1987. Between 1987 and 1991 the number of unmet applications for telephones increased from 1,455,000 to 1,634,000.

4. Year 2000 main line requirements

For the purpose of estimating the demand for lines in the year 2000, projections have been made on the basis of the growth in supply and an assessment of unmet demand, the aggregate of projected supply and unmet demand being taken to represent total demand. This approach was followed rather than projecting total demand because of the unavailability of base year unmet demand data.

Projections for growth in supply were made using growth rates between 1982 and 1991. The results of projections using this methodology appear in table 1.6. It has been estimated that total demand in the region in the year 2000 will amount to 136.7 million main lines with the demand for 27.1 million lines being unmet on current supply rates. At the same time telephone density in the region will rise from 1.64 per 100 of population in 1991 to 3.14 and 3.92 if total demand is met.

Nearly 40 per cent of the estimated 88.5 million additional telephone lines that would need to be installed to meet demand by the year 2000 would be in China (25.2 million), India (15.9 million) and Thailand (8.4 million).

In assessing total demand increases in telephone density (main lines per 100 persons), trends in unmet applications were taken into account. For example, in the case of the Republic of Korea there was virtually no backlog in unmet applications.

The accuracy of the above projection estimates will be dependent on the rate of economic growth

between 1991 and 2000. It could be expected that any acceleration in economic growth would see an increase in unmet demand unless there was a commensurate increase in supply.

5. Investment requirements

ITU has estimated the cost of supplying telephone lines at \$1,500 per line. On that basis the investment requirement to maintain supply growth rates in the region up to the year 2000 would be \$132.8 billion. Countries accounting for significant portions of this amount would be China (\$37.8 billion), India (\$23.8 billion) and Thailand (\$12.5 billion). Assuming funding has been secured for projects until the end of 1994 the value of funding already committed or secured would be of the order of \$22.8 billion. Table 1.6 shows details of the funding requirement by subregion.

ITU has also undertaken estimates of the level of investment required in the region, excluding the Central Asian republics, in providing telephone lines up to the year 2000 and arrived at a figure of \$109.6 billion. Their estimation approach assumes a 15 per cent a year compound growth rate for lower income economies and 5 per cent for higher income economies. If the same approach is extended to the Central Asian republics using 5 per cent annual growth the ITU approach yields a regional investment requirement of \$112.0 billion.

6. Selected countries telecommunications planning and projects

Advice received from a number of countries suggests that the above secretariat estimates, even though they exceed ITU estimates, are conservative rather than an overestimate of the investment requirements.

Bhutan has indicated it expects to have 11,780 lines by the year 2000 and would need 14,650 to satisfy demand (secretariat estimate 4,400). Malaysia has indicated plans to have 7.4 million lines by the year 2000 (secretariat estimate 5.8 million). The Philippines 1993-97 economic plan aims to achieve a telephone density of 4 lines per 100 people by the end of 1997 (compared with the secretariat estimate of 6 lines per 100 people by the year 2000). The Republic of Korea has indicated it needs and will have 26.6 million lines in the year 2000 (secretariat estimate 22.6 million). Thailand has indicated objectives of 6 million lines by 1996 and 11 million by the year 2000 (secretariat estimate 9.9 million). Viet Nam aims to increase its number of main lines to 1.5 million in the year 2000 (secretariat estimate 0.9 million).

China is the country with the greatest potential for accelerated growth. The Vice-Minister for Posts and Telecommunications is reported¹⁷ to have told an Asia Telecom trade show in mid-1993 that China is looking to install about 70 million new lines by the year 2000 (secretariat estimate is around 25 million new lines).

Table 1.7 shows a selection of projects being implemented or examined in the region and provides a guide to the dimensions and costs of telecommunications projects.

F. RAILWAYS

This section aims to measure investment requirements associated with projects designed to upgrade or expand railway route infrastructure, which encompasses track, track structures (for

¹⁷ 'Investors Move as Asians get on the phone', *Bangkok Post* (14 June 1993).

Table 1.6 Telecommunications, growth projections and investment requirement to the year 2000

	<i>Main line supply (thousands)</i>	<i>Unmet demand (thousands)</i>	<i>Total demand (thousands)</i>	<i>Funding required (millions of dollars)</i>
Central Asia	7,765	2,273	10,038	7,821
South Asia	23,493	11,328	34,821	37,426
South-East Asia	17,945	10,241	28,186	32,344
East Asia	59,959	3,255	63,214	54,830
Pacific islands	436	37	472	384
<i>ESCAP region</i>	<i>109,597</i>	<i>27,134</i>	<i>136,731</i>	<i>132,805</i>

Source: ESCAP secretariat estimates.

Table 1.7 Selected telecommunications projects in the ESCAP region, 30 June 1993

<i>Country</i>	<i>Project</i>	<i>Main lines installed (thousands)</i>	<i>Capital Cost (millions of dollars)</i>	<i>Status</i>	<i>Commissioning year</i>
Brunei Darussalam ¹	Ten switch exchanges	n.a.	20	Contracted	n.a.
Malaysia ¹	Digital switching equipment	750	730	Contracted	n.a.
Philippines ²	National telephone programme phase 1 tranche 1-3	28	172	Planned	
Thailand ³	Rural line expansion	1,000	1,600	Underway	1997
	Bangkok line expansion	2,000	3,400	Underway	n.a.
Uzbekistan ¹	Urban line expansion	70	n.a.	Planned	n.a.

Sources: ¹ *Economic Intelligence Unit Report*, 3rd quarter 1993.

² *Advice from Department of Transport and Communications*, August 1993.

³ "Calling Out to Growth", *Far Eastern Economic Review*, (8 April 1993), p. 39 and 42-43.

example, bridges), and signalling equipment. These projects are usually intended to increase the freight and passenger handling capacity of railway systems, or to reduce unit operating costs, or to achieve both of these objectives. In order to achieve this, railway route development projects need to allow for investment in the upgrading or expansion of motive power and rolling stock fleets where required.

The rehabilitation of route infrastructure in situations where track conditions have deteriorated as a result of the deferral or neglect of maintenance over many years, provides a major focus for infrastructure expenditure by many of the region's railway systems, but this type of expenditure had to be excluded from the study, owing to difficulties of estimation and to the fact that it is often undertaken and identified as "maintenance", rather than investment.

1. Current railway infrastructure

Table 1.8 below shows a summary of the regional railway infrastructure in 1992 for countries for which information was available. Subregional data has not been presented in recognition of the absence of information in a number of countries with significant railway systems such as the Democratic People's Republic of Korea and most Central Asian republics. To the extent that most major railway systems in the region are included, the available information provides a reasonable basis for estimating physical resource requirements and funding on railways until the year 2000 at a regional level.

Within the region the largest railway systems by far are accounted for by China and India who between them account for around two thirds of all track length in the region and commensurate shares of rolling stock.

Table 1.8 Initial railway infrastructure and requirement for year 2000

	1992	2000	
		<i>Based on historic growth</i>	<i>Based on productivity improvements</i>
Track length (kilometres)	222,795	233,118	263,974
Locomotive (number)	23,284	28,616	30,200
Freight wagons (number)	737,623	823,004	833,009
Passenger cars (number)	76,002	104,223	105,449

Source: Governments and rail systems, statistical yearbooks and ESCAP secretariat estimates.

Note: Section 2 outlines further the basis for the year 2000 projections.

2. Projecting growth in railway physical asset stock

The measurement in this study of railway infrastructure investment to the year 2000 was based on forecasts of growth in railway physical assets, including permanent way (track, signalling, and other railway route infrastructure), motive power (locomotives), freight wagons and passenger cars. In addition, supplementary estimates were made of investment in electrification and railway gauge standardization projects.

For each of the above asset categories, two estimates were made: first, a baseline projection of the growth in the current (1992) physical asset base likely to be achieved between 1993 and the end of 2000 on recent past trends; and, second, a projection of growth in the asset base in line with the likely growth in the railway traffic task and productivity improvements over the same period. The latter projection was based on trends in the following indicators:

Asset category	Load indicator	Productivity indicator
Track	Gross tonne kilometres (GTK ¹⁸)	GTK per track kilometre
Locomotives	GTK	GTK per locomotive unit
Freight wagons	Net tonne kilometres (NTK ¹⁹)	NTK per wagon
Passenger cars	Passenger kilometres (PK ²⁰)	PK per vehicle

¹⁸ Gross tonne kilometres, or GTK, is a commonly used measure of the railway output or traffic task. It represents the sum of the total weight (including freight and passengers) multiplied by distance run of all trains passing over the tracks of a railway system in a given year.

¹⁹ Net tonne kilometres, or NTK, is a commonly used measure of the freight carrying output, or traffic task, of a railway system. It represents the sum of the freight payload, or net load, multiplied by distance run, of all freight trains operating on a railway system in a given year.

²⁰ Passenger kilometres, or PK is a commonly used measure of the passenger carrying output, or traffic task, of a railway system. It represents the sum of the number of passengers multiplied by distance travelled of all passenger trains operating on a railway system in a given year.

The projections of the growth in the physical asset base were then costed at representative unit values (see below), in order to obtain estimates of probable and maximum investment levels. The funding deficiency was then identified as the difference between these two estimates.

3. Estimates of unit costs of railway assets

Within the region, the costs of track construction, per kilometre, appear to range from as much as \$1.3 million, (for an electrified line in the Republic of Korea) to as little as \$312,000 (for a non-electrified line in India). Track construction unit costs were obtained for Bangladesh, China, India, Indonesia, Malaysia, the Republic of Korea, Sri Lanka, and Thailand. These data were used to calculate representative unit costs for various groups of countries which are relatively homogeneous in terms of labour cost and the labour intensity of their track construction activity.

For locomotives, freight and passenger vehicles, the range of unit values for different countries is narrower than for track. For diesel electric locomotives, unit purchase costs tend to range between \$2.0 million and \$2.5 million; for pure electric traction, unit costs are typically between \$3.0 million and \$3.5 million; and typical unit costs of freight wagons and passenger vehicles range between \$405,000 and \$600,000, and between \$250,000 and \$500,000, respectively. For track electrification, costs per track kilometre ranging between \$170,000 (for India) and \$550,000 (for the Republic of Korea) were used. For gauge standardization projects in India (the only country of the region committed to large-scale projects of this type), a cost of \$170,000 per track kilometre was used.

4. Estimates of investment requirements to the year 2000

Summary estimates of the investment required in railways to the year 2000 are shown in table 1.9.

These estimates may be compared with the cost of projects identified at the time of writing as either underway or committed. The latter were projects identified from the trade press or from questionnaire

Table 1.9 Railways: Estimate of infrastructure expenditure requirement to the year 2000

<i>Railway asset category</i>	<i>Probable commitment of investment funds to the year 2000</i>	<i>Estimated maximum investment requirement</i>	<i>Probable funding deficiency</i>	<i>Cost of projects identified as committed or underway</i>
	(1)	(2)	(3) = (2)-(1)	(4)
	(millions of US dollars)			
Permanent way - New construction	9,350	45,724	36,374	30,907
Permanent way - Electrification	4,157	6,432	2,275	2,167
Permanent way - Gauge standardization	813	1,525	712	1,367
Locomotives	10,865	14,081	3,216	Not identified
Freight wagons	2,912	3,416	504	" "
Passenger vehicles	6,377	6,746	369	" "
TOTAL	34,474	77,924	43,450	34,441

Source: ESCAP secretariat estimates, see also footnote 21.

responses for the ESCAP "Review of Developments in Transport and Communications in the ESCAP Region 1993", either as currently in progress or for which there was a firm commitment to proceed between now and the year 2000. At the time of writing \$7,424 million had been so identified.²¹

This comparison suggests that the estimates both of the maximum investment required by the year 2000 and of the probable level of funding are likely to be realistic.

In terms of the investment likely to be required in additional track, it is estimated that China will account for by far the largest amount, \$42,153 million, or 92 per cent of the total. In recent years China has experienced a severe shortage of railway route capacity, as is suggested by the very high track productivity results for its railway system. This shortage of route capacity is now being addressed with major new line construction projects and with projects designed to expand the capacity of existing routes, for example, through double tracking, track electrification and re-signalling. Examples of capacity expansion projects already committed are the construction at an estimated cost

of \$2,960 million of a fourth east-west trunk route for a total of 820 kms from Dongshen (Inner Mongolia) to the port of Huanghua in Hebei Province, as well as the construction of a new electrified line of 245 kms from Xian to Ankang at an estimated cost of \$870 million.

Similarly, China is expected to account for a dominant share (65 per cent) of the investment estimated to be required in motive power by the year 2000. The majority of this investment will be in electric traction. India is also expected to account for a large share (32 per cent) of the forecast investment in locomotives, and in the case of India, the estimates are based on an assumption that a significant improvement in locomotive productivity will be possible with the introduction of more powerful electric locomotives into the fleet.

In the case of freight wagons, the fleets of most systems have been contracting at a time of moderate growth in rail freight traffic. This has been achieved by significant improvements in the management of the wagon fleets of many of the region's railway systems, as well as by the introduction of operational initiatives, such as the increased running of block trains, designed to improve wagon utilization. Notwithstanding these improvements, China is estimated to require a substantial investment (\$3,344 million), in order to satisfy rapid growth in freight traffic during the period 1993-2000.

²¹ Sources include various issues of *Railway Gazette International* and *International Railway Journal*, as well as questionnaire responses for the "Review of Developments in Transport and Communications in the ESCAP Region 1993" (ST/ESCAP/1333).

The forecast investment requirement in passenger rolling stock is expected to be concentrated in India, with an estimated funding requirement of \$4,098 million, out of a total for the region of \$6,746 million by the year 2000. This requirement was estimated on the assumption that the Indian Railways would achieve a significant improvement in the utilization and productivity of its passenger stock, but the size of the funding requirement is influenced by an expectation of a continuing strong growth (5.5 per cent a year) in passenger traffic.

G. ROADS AND HIGHWAYS

In the roads infrastructure sector, expenditures are typically incurred for:

- (a) Construction of new roads of various types and bridges;
- (b) Road/bridge improvement or upgrading, including paving, widening, lane expansion, reconstruction to accept heavier wheel loadings and/or permit higher speeds;
- (c) Routine preventative or corrective maintenance (for example, repair of cracked or deformed pavements).

In the majority of the developing countries of the region, these activities have been, and will continue to be, funded by Governments, although in a small number of cases Governments have recently approved private sector participation in the funding, management and operation of major new road projects. Without exception, these approvals relate to very large projects, involving outlays of around \$500 million and upwards.

A difficulty often associated with analysis of the funding of road construction and maintenance programmes is that, in many countries, the upgrading or improvement of roads is funded out of the Government's road maintenance budget, and thus cannot be distinguished in government accounts from activities properly described as "road maintenance" activities. It is not inconceivable that in some countries of the region new road construction projects, particularly those involving the construction of minor roads, are also funded as "road maintenance", thereby adding to the problem of correctly identifying expenditure on road system improvement projects.

For the purposes of this theme study road system improvement should ideally be addressed as well

as new road construction. However, because of the limitations of the available road statistics and the problem of isolating the "improvement" component of total road expenditures, the physical deficiency and resource gap analysis has been restricted to growth in the region's road stock and the costing of that growth. The resulting estimates of the maximum and likely levels of road infrastructure funding must therefore be treated as "lower bound" estimates only, given that there is substantial demand for major road improvement projects, such as those involving road paving and reconstruction in the region.

1. Road stock and growth trends

The available data indicate that in 1992 the length of all categories of roads in the developing countries of the region amounted to approximately 4,800,000 route kilometres (insufficient information is currently available on the number of lane kilometres, which would have provided a superior measure of the roads for planning purposes). Table 1.10 provides further details by subregion.

The growth of regional roads averaged about 2 per cent a year during the period 1985-1992, the fastest growth (3.9 per cent a year) being achieved in South Asia, and the slowest growth in the Pacific islands (estimated at 1.0 per cent a year) and East Asia (1.7 per cent a year). The trend information is derived from multiple data sources, as there is no single source which provides a comprehensive, continuous, accurate and time series related to the construction, maintenance and usage of the region's road networks.

However, the comparatively rapid increase of roads in South Asia masks the fact that this subregion contains two countries, Bangladesh and Sri Lanka, in which population growth has significantly outstripped road system growth, and also Nepal, which after Hong Kong, has the densest concentration of population per kilometre of road, of any developing country in the region.

The growth of roads in South-East Asia averaged 3.5 per cent a year between 1985 and 1992. Indonesia, with its road network growing at an average annual rate of 6.5 per cent during this period, achieved the fastest growth of any of the region's developing countries. This result was almost matched by that of Malaysia, with a growth in its road stock of 5.8 per cent a year. Thailand, with 4.2 per cent, also achieved growth in its road network in excess of the average for the subregion.

By contrast, road system growth in Myanmar (0.4 per cent a year), the Philippines (-0.1 per cent a year) and the Lao People's Democratic Republic (1.2 per cent a year) fell well short of population growth in those countries. No time series data were available for Viet Nam, but it is believed that the national road network in that country has been static in recent years.

Among the countries of East Asia, road system growth in China (1.6 per cent a year) has barely kept pace with population growth, whilst in Mongolia the road system grew at a rate (1.3 per cent a year) which was only about half the rate of increase in the national population. The apparent underprovision of roads in China is probably a reflection of the priority given to the development of railways and inland waterways in the past.

2. Projecting growth in the road network

Two estimates have been made: a baseline projection of the road system growth from 1993 up to and including the year 2000, reflecting historic growth; and a projection of road system growth during the same period, at accelerated rates reflecting increased demand from faster social and economic development in certain countries.

The baseline projection is an extrapolation of average annual rates of growth in the road stock, in route kilometres, achieved during the period 1985-1992 (the actual range of years within this period for which data are available vary considerably from country to country). This projection assumes that the Governments of the region will have at least the capacity to fund road infrastructure growth at its historical rate of increase.

The second projection is based on an extrapolation of trends during the period 1985-1992, in the ratio of population to road route length. In the cases of countries where the trends are "positive" road construction has lagged behind population growth. For these countries it has been assumed that during the forecast period, 1993-2000, road stock growth would occur at such a level so as to maintain the population/road length ratio at about its current level. In countries where there have been "declining" trends, it reflects growth in the road stock at faster rates than those of national populations. In such cases, where it is known that the pace of road system development has historically fallen short of socio-economic development goals, but has nevertheless exceeded the rate of population growth, it has been assumed that the population/road length ratio would decline during the forecast period at a faster rate than previously experienced.

The two projections produced by the method outlined above appear in table 1.10. A continuation of historical growth will result in an increase of 1,350,000 kilometres in the region's road network by the end of the year 2000. This is the baseline forecast used to calculate the most likely level of commitment of investment funds to the roads sector within the study time-frame.

By contrast the forecast of growth in the road network in line with a declining ratio of population to road length suggests a need to add as much as 2,010,000 kilometres to the region's network within this time-frame. This is the upper limit to road infrastructure growth, on the basis of which the gross increment in investment funds required by the roads sector is calculated.

Table 1.10 Roads, stock growth projections and funding requirements

	Road length (kilometre)		Funding required (millions of US dollars)	
	1990	2000	Historic growth	Road density basis
Central Asia	347,900	347,900	—	5,373
South Asia	2,492,620	3,394,191	35,161	46,605
South-East Asia	855,492	1,147,594	57,438	63,936
East Asia	1,121,493	1,278,523	23,981	44,450
Pacific islands	27,624	29,249	325	1,305
ESCAP region	4,845,129	6,197,456	116,906	161,670

Source: Statistical Yearbooks, questionnaires and ESCAP secretarial estimates.

3. Investment requirements in roads

Within the region, the costs of road construction per kilometre appear to range from as much as \$42 million for the second stage (elevated) Bangkok expressway system in Thailand, to as little as \$11,300 for a gravel standard rural road in India. In all countries of South Asia, in China and in some countries of South-East Asia, the average cost of road construction will be affected significantly by the length and cost of rural or minor provincial roads, which in these countries comprise a large proportion of the total road network. In India, for example, rural roads account for about 84 per cent of the national road network measured in route kilometres. In Viet Nam and Thailand, rural roads account for two thirds of the national road network, but the rural road networks of these countries are not comparable in terms of quality (the Thai system having a significantly higher proportion of paved roads than the Vietnamese system).

The cost data available for India, Thailand and Viet Nam were used as a basis for estimating the expected and required road investment in these countries and in other countries considered to have a similar mix of road types and to be at a similar stage of development. In the case of China, the average road construction cost used was the average reflected in outlays under the 7th Five-year Plan (1986-1990).

Application of unit road construction costs, as outlined above, resulted in the following average costs per kilometre for each subregion:

(a) Central Asia	\$93,000
(b) South Asia	\$41,000
(c) South-East Asia	\$175,000
(d) East Asia	\$103,000
(e) Pacific islands	\$200,000

Using these unit costs the dollar investments associated with each of the two road growth projection forecasts are calculated respectively at \$116.91 billion and \$161.67 billion. As the first figure represents a level of growth which has been funded by Governments in the past, the difference of \$44.76 billion is considered to represent the likely funding deficiency.

4. Significant areas of growth and funding

Of the additional 2 million kilometres of roads estimated to be required in the region in the second forecast, India is estimated to require 941,000 kilometres, or 47 per cent. However, India's road construction programme is likely to be focused on the construction of rural roads, as it has been in the recent past. Consequently, India is estimated to require only 23 per cent (\$36.69 billion) of the road sector investment funds estimated (in the second forecast) to be required throughout the region prior to the end of the year 2000.

Next in order of magnitude, in terms of the physical requirement, is China which is estimated in the second forecast to require an additional 434,000 kilometres of road up to the end of the year 2000, representing 21 per cent of the region's estimated requirement. China's roads requirement, however, was costed at only \$17.73 billion, or just 11 per cent of the region's estimated investment need.

Although ranking third in terms of physical requirement, South-East Asia, is estimated to require the highest level of roads investment of any subregion, \$63.94 billion, or nearly 40 per cent of the regional total. Indonesia, with the fastest rate of road system growth in the region during the period 1985-1992, is expected to account for almost half of this amount. The concentration of road investment needs in South-East Asia is explained both by the higher standard of road development and the higher unit cost of road construction in this subregion, as compared with South and East Asia.

5. Comparisons with other estimates

The estimates in this study were cross-checked with those from independent sources. In particular, comparisons were made against estimates of road infrastructure funding needs in China, India, and Thailand.

China

The physical road construction requirement to the year 2000 was recently estimated at 400,000 to 600,000 kilometres of new road, bringing the total road length to 1.3 - 1.5 million kilometres.²² The theme study second forecast estimated a road

²² Country Paper for People's Republic of China, *Regional Seminar on Transport Policy*, Manila, February, 1989 (Asian Development Bank, Manila, 1989).

construction requirement for China of approximately 420,000 kilometres between now and the year 2000, resulting in a growth in the road stock of 1.48 million kilometres. Thus, the physical growth forecast of the theme paper study is considered to be realistic. Similarly, the forecast of the likely commitment of government funds for road construction (\$6.25 billion) does not appear to be unrealistic, given an expenditure on road system development under the 7th Five-year Plan (1986-1990) of yuan renminbi 20 billion (\$3.64 billion).

The estimated large (\$11.48 billion) funding deficiency, however, suggests an increased reliance on non-government funding sources in future.

India

Two recent studies were reviewed. In one, it was observed that more than 50 per cent of villages in India were as yet unconnected with all-weather roads. In this study, it was estimated that an amount of \$54.27 billion would need to be expended over 15 years between 1988 and 2003, in order to bring the total road system up to a satisfactory standard.²³ Of this amount, it was estimated that \$30.49 billion would be required for upgrading and expanding the existing road system (the latter involving only the construction of 1.1 million kilometres of new rural roads, whilst \$23.78 billion would be required for road system maintenance. If the improvement component of this estimated expenditure is adjusted to reflect a funding requirement over the time-frame adopted for the theme paper (8 years), rather than the 15-year period on which this study was based, the total investment requirement would amount to only \$16.26 billion, as compared with \$36.69 billion for the theme paper study). However, this calculation takes no account of the inflation of road construction costs since 1988, which could easily have increased this amount to \$20 billion (reflecting an annual 5 per cent cost inflation, between 1988 and 1992). Additionally, this estimate conflicts, to some extent, with that of another recent study.

In the second study, it was estimated that \$24.19 billion would be required, between 1991 and the year 2000, for the upgrading and expansion of the

national highway system of India alone.²⁴ This estimate allows for a doubling of the present length (about 33,000 kilometres) of the national highways system and is justified on the basis that whilst the national highway system has been growing at an annual rate of only 0.5 per cent, as compared with 4 per cent for the total road system in India, it now carries an estimated 40 per cent of the nation's passenger and freight traffic, and is fast becoming inadequate to cope with further growth in this task.

If the amount estimated in the first study to be required for rural road construction (\$12.87 billion) is adjusted to an 8-year time-frame, inflated to 1992 values and then added to the above estimate of \$24.19 billion for national highway system improvement, the resulting estimate of total road system investment needs in India to the year 2000 amounts to approximately \$33 billion, which is not very far from the theme study estimate.

Some difficulty arises, however, with the first forecast of the theme study (i.e., the estimate of the likely commitment of investment funds), since the total amount allocated for road work under the current Eighth Five-year Plan for India is \$4.99 billion. If this allocation is inflated and adjusted to the theme paper timescale, it is difficult to forecast a government allocation of more than about \$12 billion for all road work in India between now and the year 2000. This would result in a much wider funding deficiency than that estimated by the method described above, perhaps reflecting the extent to which funding sources outside the government budget might need to be tapped, in order to close the gap.

Thailand

In the current Seventh Plan, covering the period 1992-1996, an amount of \$8.02 billion has been committed for highway development. Of this amount \$5.44 billion has been allocated for investment projects and \$1.39 billion for road maintenance.

The Department of Highways is responsible for only 26 per cent of the total length of roads in Thailand, and its allocation of investment funds more than doubled in real terms between the Sixth and

²³ D.P. Gupta and others, "Strategy for Road and Road Transport Development: Emerging Issues" in *Indian Roads Congress Journal*, vol. 51-3 (November 1990).

²⁴ R.P. Sikka, "Growing Crisis of Managing the Trunk Route System in India", in *Indian Roads Congress Journal*, vol. 53-2, (September, 1992).

Seventh Plans. Therefore, the theme paper estimate of \$14.78 billion for the likely commitment of investment funds for roads in Thailand up until the year 2000 is likely to be realistic.

H. URBAN PUBLIC TRANSPORT

The approach used for the purposes of this study was to identify planned and committed investments in urban public transport projects by means of a search of the relevant trade literature. The literature search yielded the following information:

- (a) The investment in specific urban public transport projects, either currently underway, currently committed, or planned for commencement, throughout the developing countries of the region, between now and the year 2000.
- (b) Of the total investment in (a) above, the investment for which funds have already been allocated.

The aggregate of investment across all urban public transport projects was regarded for the purposes of this study as representing the investment requirement in this sector. The difference between (a) and (b) above was similarly regarded as being the probable funding deficiency which would need to be covered between now and the year 2000.

1. What constitutes urban public transport ?

For the purposes of this study, "urban public transport" includes all facilities offering common user passenger transport services in urban areas, except urban roads (including expressways and tollways). Included under this heading are the following urban public transport modes:

- (a) **Metro, or urban mass transit, systems**, which are high speed, high capacity (up to 80,000 passenger journeys per direction per hour) guided transport systems operating on their own dedicated permanent way, either underground, or on the surface on above-ground structures;
- (b) **Light rail, or LRT, systems**, which are similar to metro systems in that they are guided systems operating on their own dedicated right of way, but are of lighter track and vehicle construction,

and provide a lower people movement capacity (typically no more than 25,000 - 30,000 passenger journeys per direction per hour);

- (c) **Suburban heavy rail**, involving the operation of urban passenger trains on the urban portion of the established general railway system, which, in general, they share with long distance passenger and freight trains;
- (d) **Monorail systems**, which are based on the operation of passenger carrying vehicles on specialized single rail elevated structures. The passenger carrying capacity of monorails is considerably less than that of LRT systems;
- (e) **Tramways**, which are guided transport systems operating on that part of the urban road network equipped with rails and an overhead electric power supply. Unlike metro and LRT systems, trams do not always operate in multiple units, and have a considerably lower passenger carrying capacity.
- (f) **Guided busways (sometimes called "O-Bahn" systems)**, involving the operation of rubber tyred buses equipped with guide wheels along guideways constructed along major roads. These buses may also operate conventionally on the urban road network;
- (g) **Trolley buses**, or conventionally steered rubber tyred passenger carrying vehicles, operating on the urban road system, but powered by electric traction motors, for which electric power is transmitted via overhead wires;
- (h) **Buses**, or rubber tyred passenger carrying vehicles, powered by internal combustion engines, and operating freely on the urban road system;
- (i) **Ferries**, or passenger carrying vessels operating on riverine and harbour services within urban areas.

In practice, the current focus of urban public transport investment programmes is on the construction of high capacity, segregated and specialized systems of the metro or LRT type. Some of the above-listed modes, such as trams

and trolley buses, are no longer favoured, owing to their relatively low passenger carrying capacity and operational inflexibility.

2. Identified investment requirement

The consolidated data obtained by means of the literature search (see table 1.11) indicate a total investment requirement, for the period 1993-2000, of \$67.79 billion, of which only \$10.87 billion was clearly identified as committed, leaving a deficiency of \$56.91 billion still in need of funding by the year 2000. The distribution of this investment by subregion, when reviewed against the distribution of the region's urban population, shows a substantial imbalance in the case of South Asia.

In spite of the fact that South Asia contains more than one-third of the developing ESCAP region's urban population, and is expected to experience a faster rate of urban population growth during the period 1990-2010 (4.0 per cent a year, as compared with an annual average of 3.7 per cent for the region's developing countries), only 5 per cent of the urban public transport investment forecast for the region during the period to the year 2000 is likely to be expended in South Asia. Calcutta is the only South Asian city with a high capacity urban mass transit system, although a metro system is currently under construction in Teheran, whilst another for New Delhi has been in the detailed planning stages for some five years.

Of the total investment of \$51.82 billion identified for East Asia, planned investment in subway systems in seven cities of the Republic of Korea is expected to account for \$31 billion. Similarly, a small number of projects is projected to dominate expenditure on urban public transport infrastructure in South-East Asia, with three urban mass transit projects in Bangkok possibly accounting for \$5.36

billion, out of a total for the subregion of \$12.61 billion.

New construction and extension of metro systems may be expected to absorb \$55.78, or 82 per cent, of the total urban public transport investment forecast for the region, with the development of light rail transit (LRT) systems absorbing another \$7.64 billion (11 per cent).

Some of the investment projects included in table 1.11 must be classified as uncertain. For example, in Bangkok, of three urban mass transit projects approved by the Government of Thailand in 1990 only one (a project combining suburban rail, an LRT and a tollway, to be developed by Hopewell Holdings under a 30-year build-operate-transfer (BOT) concession) has actually proceeded to the construction stage.

Similarly, announcements have been made at the political level of proposals to develop urban mass transit projects in Jakarta,²⁵ (involving initially a 55-kilometre extension of the existing suburban rail network, followed by the construction of an LRT system). Feasibility studies of these proposals were completed three years ago, yet it does not appear that their implementation is imminent.

I. AIRPORTS

A search of the relevant trade literature was undertaken in order to identify:

- (a) The current position and development in airport and aviation equipment either currently underway, committed, or planned for commencement.

²⁵ Chartered Institute of Transport, *Singapore Transport and Logistics*, vol. 2, No. 2 (September 1993).

Table 1.11 Urban public transport investment and urban population, by subregion

	<i>Required investment to the year 2000</i>		<i>Share of urban population, ESCAP developing countries (percentage) *</i>
	<i>\$US billion</i>	<i>Share</i>	
South Asia	3.36	5.0	36.7
South-East Asia	12.61	18.6	14.9
East Asia	51.82	76.4	48.3
ESCAP region	67.79	100.0	100.0

Source: ESCAP secretariat estimates.

* Based on country composition of ESCAP and urban population in 1990. (Source for latter, United Nations, *Urbanization Trends*, 1990).

throughout the developing countries of the region, between now and the year 2000;

- (b) Of the total investment identified in (a) above, the investment for which funds have already been allocated;
- (c) The difference between (a) and (b), being the probable funding deficiency, which would need to be covered between now and the year 2000.

1. The level of regional air traffic

During the period 1980-1990, the air passenger traffic of the Asian and Pacific region (measured in terms of passenger-kilometres) grew at an average annual rate of 8.0 per cent, compared with a growth rate of 5.7 per cent a year for the world and 5.8 per cent for the next fastest growing region, North America.²⁶

The Asian and Pacific region also experienced the fastest rate of growth in scheduled air freight traffic of any region in the world, with 11.3 per cent annual growth during the period reviewed, compared with 7.3 per cent for the world and 6.4 per cent for the next fastest growing region, Europe. The International Civil Aviation Organization (ICAO) has predicted a continuation of these growth trends during the period 1990-2001.²⁷

Certain developing countries of the region have experienced growth in air passenger and freight traffic at much higher rates than those of the region as a whole. In the Republic of Korea, air passenger traffic grew from 9.83 million in 1988 (3.66 million international traffic) to 18.94 million in 1992 (5.13 was international traffic). This reflects an average annual growth of 17.8 per cent for total passenger traffic and 8.8 per cent for international passenger traffic. Similarly, air passenger traffic in Malaysia and Sri Lanka grew at double digit rates during this period (13.5 per cent for total traffic and 10.2 per cent for international traffic in the case of Malaysia; and 10.8 per cent for total traffic, all international, in the case of Sri Lanka).

²⁶ International Civil Aviation Organization: Input for ESCAP *Review of Developments in Transport and Communications in the ESCAP Region 1993* (ST/ESCAP/1333)

²⁷ Ibid.

2. Current status of major regional airports

Seven major "hub" airports: Taipei-Chiangkai-shek, Hong Kong-Kai Tak, Tokyo-Narita, Osaka-Itami, Seoul-Kimpo, Singapore-Changi, and Bangkok-Don Muang - handle some 68 per cent of all passenger trips between Asia and Europe, and 86 per cent of all trans-Pacific trips to and from Asia.²⁸ In addition, these airports are estimated to handle more than 75 per cent of all intraregional passenger traffic.

Passenger handling capacity is under pressure at all of these airports, with the exception of Singapore, where major terminal expansion projects recently have been, and are currently being, undertaken. At some of these hubs, notably Hong Kong and Seoul, capacity shortages are becoming critical, as passenger traffic continues to grow at rates in excess of 10 per cent a year.

Problems associated with airport capacity shortages are by no means confined to the hub airports of the region. The following description of the demand/capacity problems at selected airports in the developing countries of the region, and the measures being taken to relieve them, provides a clear indication of the scale of the overall problem.

Taipei - Chiangkai-shek

The number of passengers handled at this airport in 1991 was more than 10 million, as compared with the theoretical capacity of the airport to handle 12 million passengers a year. The second phase expansion project currently underway involves the construction of two new runways and a second terminal to handle 12 million passengers a year. Following completion of this project, the airport will have sufficient capacity to handle the projected level of traffic up until the year 2000, although a capacity shortage will begin to re-emerge at that time, given projections of an increase in passenger volume to 41.5 million by 2010.²⁹

²⁸ *Far Eastern Economic Review* (24 September 1992).

²⁹ *Asian Aviation* (May 1992).

Hong Kong - Kai Tak

Aircraft movements and passenger traffic through Kai Tak Airport are expected to reach their annual capacity levels of 134,000 and 24 million respectively, by the end of 1993. Land reclamation for the new airport at Chep Lap Kok is currently underway, with the total cost of the airport project (without the supporting land transport infrastructure) now estimated at \$10 billion. The new airport is designed to provide a passenger handling capacity of 87 million passengers a year and it is scheduled for completion by mid-1997. It is probable that \$2-3 billion will have to be provided through commercial borrowings.³⁰

Kuala Lumpur - Subang

This airport handled 5.94 million passengers in 1990/91, and passenger volume is estimated to be growing at 18-20 per cent a year. By the end of the decade, Subang is expected to be handling up to 12 million passengers and 110,000 aircraft movements a year. Apron parking space is now severely limited and the domestic traffic has been transferred to a small temporary terminal. The fact that the airport is surrounded by housing and is shared with military operations has restricted the scope for its further expansion and limited construction of additional aircraft parking bays and terminal upgrading. Consequently, the Government of Malaysia has approved the construction of a new international airport at Sepang, 50 kilometres to the south of Kuala Lumpur. The first phase of this project, to be completed by 1997, will provide capacity to handle 25 million passengers a year, with subsequent development up to 100 million passengers a year.³¹

Manila - Ninoy Aquino

The international terminal at this airport is designed to handle 5 million passengers a year, and is currently estimated to be handling something close to this number. Plans call for the construction, by 1996, of a new cargo handling facility and a second international passenger terminal, designed to handle 7 million passengers a year. A third international terminal is in its early planning stages, but it has not yet been determined whether this terminal will be constructed in Manila, or at the former United States Clark Air Force Base, which is

being considered as the site for a new international airport.³²

Seoul - Gimpo

Seoul's Gimpo International Airport is estimated to have a capacity to handle 24 million passengers a year.³³ Provisional figures for 1992 show that the airport handled 21.23 million passengers (88 per cent of theoretical capacity), and if growth in passenger traffic continues at about the rate of increase experienced between 1991 and 1992 (11.7 per cent), the airport will have reached saturation point by the end of 1994. The new Seoul International Metropolitan Airport (NSMA) project was launched in late 1992. This project involves the construction of an entirely new airport on reclaimed land near Incheon, at an estimated cost of \$12.7 billion, some \$6 billion of which will be expended prior to the year 2000. However, the first phase of this project will not be completed before 1997, and only then will the new airport be able to absorb the international traffic currently handled through Gimpo.³⁴

Bangkok - Don Muang

In 1992, the total number of passengers handled at Don Muang was 14.86 million, of which approximately 11 million were international passengers. The international terminal has the capacity to handle 16 million passengers a year. Thus, international passenger traffic has reached nearly 70 per cent of theoretical capacity. If the strong growth evident prior to 1992 (about 17 per cent a year) were to re-occur, the existing international terminal would reach saturation point by 1995. The Airports Authority of Thailand has launched the Bangkok International Development Plan (1991-1997), under which the passenger handling facilities and the number of aircraft parking bays at the international terminal will be increased (allowing an expansion of passenger handling capacity to 25 million per year), a new domestic terminal will be constructed, and car parking and cargo handling facilities will be expanded, at an estimated cost of \$272 million. In addition, land acquisition for the construction of a new Bangkok International Airport at Nong Ngu Hao, 34 kilometres east of Bangkok, is currently underway. This project has an estimated total cost of \$8 billion and will proceed in four phases. The first phase will

³⁰ *Asian Aviation* (December 1990 - January 1992).

³¹ *Aircraft Support* (October 1991).

³² *Airports International*, (March 1993) and *Bangkok Post* (Shipping Post Supplement), (15 October 1993).

³³ *Asian Aviation* (November 1992).

involve the construction, by the year 2000 at a cost of approximately \$1.20 billion of a 3,700-metre runway and a terminal building, having capacity for 25 million passengers per year.

3. Airports, investment requirement

The literature search approach was used to provide a guide to the investment requirement of the sector. The data obtained by this means (see table 1.12) indicate a total investment requirement, for the period 1993-2000, of \$44.7 billion, of which only \$4.9 billion was clearly identified as committed, leaving a deficiency of \$39.8 billion still in need of funding by the year 2000.

Of the total investment requirement identified, \$29.00 billion, or nearly 65 per cent, is expected to be spent in East Asia, with two new airport development projects, in Hong Kong and the Republic of Korea, alone accounting for \$16.6 billion of this amount. The countries of South-East Asia are expected to have the next largest requirement for investment funds, with an estimated \$14.57 billion, or 33 per cent of the regional total, being required by the year 2000. Of this amount, \$10.70 billion is estimated to be needed for the new airport at Kuala Lumpur (Sepang).

An investment of \$39.36 billion will be required for 15 new airport construction projects throughout the region, representing 88 per cent of the total investment requirement. The balance, of \$5.38 billion will be needed for the expansion and or improvement of existing airport/airways facilities.

J. SEAPORTS

While ports in general are becoming more specialized, the introduction and growth of containerization has and will continue to have the greatest impact on port infrastructure development through and beyond the end of the century. Already the ESCAP region is the home of the world's largest container ports (six of the top ten)³⁴ including Hong Kong and Singapore, the two biggest in the world, each of which is one and a half times the size of the biggest in any industrialized country.

Port container traffic growth rates in the subregions, during the five years leading up to the survey period have been: South Asia 12.9 per cent, Association of South-East Asian Nations (ASEAN) 17.3 per cent and East Asia 11.3 per cent. With forecast economic growth in the region and the continued penetration of containerization into the general cargo market container traffic is projected to continue to grow at rates far in excess of world levels³⁵ (see table 1.13) even though somewhat lower than in previous years.

Countries of the region are also harnessing the economic impetus generated by port development by integrating important processing facilities such

³⁴ *Containerization International Yearbook 1993* (London, The National Magazine Company Limited, 1993).

³⁵ ESCAP, *Prospects for Container Shipping and Port Development: South Asia Subregion, 1993* (ST/ESCAP/1318); *ASEAN Subregion, 1993* (ST/ESCAP/1210); *East Asia Subregion, 1994* (ST/ESCAP/1321).

Table 1.12 Airports, investment resources required to the year 2000

	<i>Investment required (millions of dollars)</i>	<i>Investment gap (millions of dollars)</i>
Central Asia	86	—
South Asia	881	611
South-East Asia	14,568	13,104
East Asia	28,999	25,955
Pacific islands	206	126
ESCAP region	44,740	39,796

Source: ESCAP Secretariat estimates.

Table 1.13 Trends in port container throughput

<i>Subregion</i>	<i>Projected annual container growth rate 1993-2000 (percentage)</i>	<i>Compared to the world 1993-2000 (multiplier)</i>
South Asia	9.3	1.46
South-East Asia	11.0	1.77
East Asia	9.2	1.37

Source: ESCAP secretariat estimates.

Note: The multiplier of, for example, 1.46 for South Asia means that the throughput would be 46 per cent higher than if South Asia's container growth rate had been at the world growth rate.

as refineries, steel works or export processing zones, such as at Daxie Island in China, Port Qasim in Pakistan and Map Ta Phud in Thailand. This in turn has seen increased pressure for raw materials and the need for development of liquid and dry bulk facilities.

1. Methods used for forecasting growth in port infrastructure

Outputs generated by the ESCAP Maritime Policy Planning Models (MPPM)³⁶ recently employed to evaluate container port and shipping demand across continental Asia, through to the year 2000, have been used as the basis for investment demand forecasts for container ports.

For bulk handling ports which often rely on the development of parallel industrial complexes and in which investment levels can vary widely, it has not been possible, within the time frame for this study, to make projections. Instead literature searches have been carried out encompassing national five- and seven-year plans and trade journals. It should be noted, however, that this methodology results in significant underestimation of the investment requirements.

Port expenditures are typically incurred for:

- (a) Creating new ports and terminals for containers, liquid/dry bulk commodities and general cargoes;
- (b) Expanding of existing ports through the construction of additional berths;

- (c) Reconstructing/refurbishing berths and particularly converting break bulk facilities to container handling;
- (d) Deepening channels so that bigger ships can access ports;
- (e) Reclaiming land for port development, port related activities and other usage;
- (f) Replacing/upgrading equipment;
- (g) Maintaining channels, berths and equipment.

Regional factors driving the growth of containerization have been the introduction of multimodal transport, with the opportunity of door-to-door cargo movements; and the potential containerization to alleviate problems of switching between modes of transport and overcoming break of gauge problems for rail traffic in the transit corridors. These and the issues related to reducing the labour content in port activities in the industrialized countries will ensure the continued growth of containerization. For the South Asian subregion and China, which are still in the relatively early stages of containerization, growth of this form of transport will continue unabated far into the next century.

2. Estimates of investment requirements to the year 2000

In the case of container berths the basic infrastructure of the berth, stacking area, minimum equipment configuration and an allowance for dredging, reclamation, buildings/superstructure and access has been estimated to be \$90 million for a typical 330 metre berth. In the case of restructuring a general cargo facility for container operations including equipment and paving, \$30 million has been used.

³⁶ The Maritime Policy Planning Models consist of trade, shipping and port databases, with projection models designed to forecast trade growth, container demand and resulting requirements for shipping and port services.

For bulk handling facilities with their particular investment requirements it is considered inadvisable to use estimated unit costs. Instead reported expenditures for specific developments have been recorded.

Table 1.14 shows the estimated port investment requirements to the year 2000 based on the above considerations and literature searches for projects proposed and underway.

Table 1.14 Port investment resource requirements to the year 2000

	<i>Investment required (millions of dollars)</i>
South Asia	4,057
South-East Asia	6,432
East Asia	15,018
ESCAP region	25,506

Source: ESCAP secretariat estimates.

3. Comparison with other projections

For the reasons explained earlier neither ESCAP nor outside agencies are in a position to make adequate long-term forecasts (year 2000) of bulk handling ports. There are, however, a number of projections in the container sector. The most recent ESCAP MPPM projections for world container traffic growth is 6.7 per cent, somewhat less than the performance of 8.0 per cent achieved during the 1980s. The ESCAP projection is, however, higher than other published forecasts of Drewry Shipping Consultants at 4.7 per cent over the period 1990-1997³⁷ and a somewhat closer projection by DRI/McGraw-Hill/Mercer World Trade Service which suggests 5.9³⁸ per cent a year.

³⁷ Drewry Shipping Consultants, *Container Market Profitability to 1997* (London, Drewry, 1992).

³⁸ Calculated from data presented in DBS/McGraw-Hill/Mercer Management Consulting Inc., *World Trade Service Review Second Quarter, 1993*, which excludes elements of world trade and transshipment traffic.

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Chapter II

POSSIBLE SOURCES OF FINANCE

The estimates of the infrastructure deficiency described in the previous chapter clearly show that, even under the modest assumptions made concerning required improvements in the availability and productivity of infrastructure facilities, there is a formidable task ahead to find the resources necessary. This chapter provides an overview of the level and adequacy of past expenditure on infrastructure, the scope for increased public sector financing, and the past levels and prospects for foreign financing.

A. CURRENT APPROACHES TO FUNDING

In developing countries of the ESCAP region, funding for infrastructure development has traditionally come from government development budgets, loans (both soft and commercial) and aid from overseas. The role and significance of these funding sources varies from country to country reflecting a range of factors including the financial position and state of development, the sophistication of domestic financial markets and levels of private disposable income, and the extent and efficiency of direct and indirect taxation regimes. A number of countries have been examined below in terms of their funding strategies.

In the case of Pakistan, the total Federal Government expenditure proposed under the public sector development programme for the Seventh Plan (1988-1993) was 248 billion rupees. Of this total, 157 billion rupees were allocated to public corporations, with 118 billion going to corporations involved in infrastructure. These corporations were two electricity supply corporations, Telegraph and Telephone, the Civil Aviation Authority, Karachi Port Trust and the national airline and shipping companies (see table 2.1). For the power corporations, 41 per cent of allocated expenditure was to be derived from budget and foreign aid, 34 per cent from self-financing (reinvested profits), 19 per cent from domestic equity markets and financial institutions and only 6 per cent from foreign investment sources. Around 67 per cent of funds for the transport and communications corporations was expected to be found from self-financing with most of the remainder (31 per cent) to come from

foreign loans/equity.

The remaining 91 billion rupees was allocated to federal government departments, including railways and roads. It was proposed that 100 per cent of this was to be financed from budget and foreign aid. The figures contained in the plan combine budget and foreign aid as fund sources. It is probable that all funds for departments come from budget.

Overall Pakistan appears to be relying, to large extent, on domestic funding sources supplemented by foreign aid, with only 7 per cent of funding coming from overseas direct investment.

In Malaysia, the public sector includes, *inter alia*, the Federal Government and non-financial public enterprises (NFPEs)¹. The development allocation for the transport and communications sectors under the Sixth Malaysia Plan, 1991-1995², was 25 billion ringgit, of which 11 billion was allocated to the Federal Government and 14 billion to the NFPEs, the majority of which was investment or expenditure by the port authorities, Malaysian International Shipping Corporation Berhad, Perbadanan National Shipping Line Berhad, Malaysian Airlines, privatized highways and Telekom Malaysia Berhad. Of the 11 billion ringgit allocated to the Federal Government, 7.6 billion represented expenditure on roads and bridges (including rural roads).

In outlining the means of financing the plan, it was noted that, "Although the deficit can be financed from domestic borrowing, the Government will continue to raise external loans, especially project loans, from foreign multilateral institutions and bilateral sources whenever necessary and on favourable and attractive terms."

The socio-economic stabilization and development strategy to the year 2000, adopted by the Government of Viet Nam in June 1991, estimated that in order to double gross domestic product in a decade, \$40 billion would be required. It was estimated that half of this amount could be financed from domestic sources (Government \$7-8 billion and enterprises/individuals \$12-13 billion). Of the

¹ NFPEs are large enterprises which have more than 50 per cent government equity share and an annual turnover of more than 50 million ringgit.

² Government of Malaysia, *Sixth Malaysia Plan, 1991-1995* (Kuala Lumpur, 1991).

Box I. FINANCING METHODS FOR SOCIAL OVERHEAD FACILITIES INVESTMENT IN THE REPUBLIC OF KOREA

There are many means by which infrastructure development can be financed. However, the stage of development which the country has reached will influence the availability of some of these means. Indicative of the sources available in one of Asia's leading economies are those being used in the Republic of Korea.

Most infrastructure projects envisaged under the Seventh Five-year Plan (1992-1996) will require huge investments. Funds needed to finance such projects will be secured through various measures. First, the tax rate on oil products, including gasoline and light oil, the domestic prices of which are considerably lower than those in other oil-importing countries, will be increased. Second, user fees, such as electricity rates, airport fees, and water rates, will be gradually readjusted upward to a more realistic level. Third, to help local governments finance the expansion of social overhead facilities, such as city roads, a regional development tax will be introduced. Fourth, the Government will also consider such measures as increased issuance of bonds by local authorities and government-invested enterprises, and encourage the investment of private capital in road and harbour projects.

Source: *The Seventh Five-year Economic and Social Development Plan (1992-1996)*, Government of the Republic of Korea, 1992.

Table 2.1 Pakistan Seventh Plan (1988-1993) Expenditure Programme
(millions of rupees)

<i>Organization¹</i>	<i>Budget & foreign aid</i>	<i>Self finance</i>	<i>Domestic equity/ market loan</i>	<i>Bank borrowing</i>	<i>Foreign loan/ equity</i>	<i>Total</i>
PUBLIC CORPORATIONS						
Power	36,250	29,434	12,256	4,242	5,185	87,367
– WAPDA	36,250	28,388	12,256	0	0	76,894
– KESC	0	1,046	0	4,242	5,185	10,474
Transport & communications	0	20,341	0	615	9,495	30,451
– T&T	0	16,970	0	0	4,667	21,637
– CAA	0	2,828	0	0	1,414	4,242
– PNSC	0	0	0	615	1,442	2,057
– PIAC	0	104	0	0	848	952
– KPT	0	364	0	0	824	1,188
– NTC	0	75	0	0	300	375
TOTAL FEDERAL GOVERNMENT DEPARTMENTS	91,436	0	0	0	0	91,436
TOTAL EXPENDITURE	127,686 (61%)	49,775 (24%)	12,256 (6%)	4,857 (2%)	14,680 (7%)	209,254 (100%)

Source: Government of Pakistan, *Seventh Five Year Plan 1988-1993 & Perspective Plan 1988-2000*, table 7.1.

Note: WAPDA: Water and Power Development Authority, KESC: Karachi Electric Supply Corporation, T&T: Telegraph and Telephone, CAA: Civil Aviation Authority, PNSC: Pakistan National Shipping Corporation, PIAC: Pakistan International Airlines, KPT: Karachi Port Trust, NTC: National Tanker Corporation.

remaining \$20 billion it was estimated that it would be feasible to attract \$12-13 billion in foreign direct investment with the remaining \$7-8 billion being sought from official development assistance (ODA).

In contrast to the above examples where domestic financing features prominently, Bhutan's Seventh Five-year Plan, 1992-1997³, contains 31 projects in the transport, communications and energy sectors, all requiring nearly 100 per cent external financing.

This cross-section of country experience provides a general indication of the direction from which development finance is being sought and obtained. For countries such as Malaysia and Pakistan, major transport undertakings (seaports, airports, national shipping lines and national airlines), telecommunications organizations and power generating establishments are being asked to obtain their own funds from self-financing and domestic or foreign market loans or equity. The subsectors which rely heavily on public sector funds are railways, roads and water supply.

Disadvantaged economies in transition, such as Viet Nam, despite having recourse to substantial domestic funding in relation to their estimated requirements, also have a significant requirement for ODA. Least developed countries, such as Bhutan, have a requirement for nearly all of their physical infrastructure development to be financed from foreign sources.

The case of Bhutan highlights an area where caution has to be exercised in making a direct link between the financing requirements of the physical infrastructure sectors and the funds drawn upon for meeting those requirements. Investment or gross capital formation in infrastructure is only part of a country's total investment. From an accounting perspective, total *ex post* gross domestic savings (GDS) less total *ex post* gross capital formation (GCF) yields a resource gap and this resource gap must be filled by foreign savings.

Table 2.2 shows this resource gap for the years 1989 to 1992. In each of these years, Hong Kong, Singapore and Taiwan Province of China have been net suppliers of foreign savings, whilst the least developed countries of Bangladesh, Lao People's Democratic Republic and Nepal have been net recipients of foreign savings.

³ Royal Government of Bhutan, Planning Commission, *Seventh Five Year Plan, 1992-1997* (Thimphu, December 1991).

Domestic savings can be broken down further into private sector savings and public sector savings. There is, however, no a priori reason why the funds required for investment in infrastructure should be drawn specifically from the private, public, foreign sector or any particular combinations of these sources. If, for example, there are institutional or financial reasons why the private sector does not desire to invest in physical infrastructure then this role falls upon the public and foreign sectors. Similarly, if the public sector finds that investment in physical infrastructure is more attractive to potential aid agencies then analysis of financing practices will reflect a greater role of ODA in infrastructure finance.

B. PUBLIC SECTOR FUNDING

1. Fiscal policy as a funding source

Government expenditure on infrastructure development normally, although not exclusively, comes from the capital (or development) budget. Increased taxation has often been widely recommended as a means of raising the overall amount of internal resources mobilized and thereby, other things being equal, to enhance the availability of financing for large capital investment through higher savings within the public sector.

In general, there has been a rising share of domestic incomes channelled through the government sector. Central government revenue (both tax and non-tax), for example, has increased as a proportion of GDP in most of the developing ESCAP region over the past several decades (see table 2.3). Also, in general, Governments in East and South-East Asian countries have been able to mobilize a greater share of GDP than, for example, in South Asian countries. A limited tax base, the structure of income distribution, and weaknesses in tax collection and enforcement are among factors which have impacted on the fiscal efforts and outcomes.

Some Pacific island economies are characterized by exceptionally high ratios of total revenue/GDP. The public sector tends to be predominant as a provider of employment in the monetized sector, especially in smaller islands where alternative avenues of cash earnings are rather scarce. Indeed, government undertakings have been more extensive than just being limited to the provision of public utilities and services.

Table 2.2 Domestic savings, capital formation and resource gap as a percentage of gross domestic product of selected developing member countries areas of Asian Development Bank, 1989-1992

Country/areas	Gross domestic savings				Gross capital formation				Resource gap			
	1989	1990	1991	1992	1989	1990	1991	1992	1989	1990	1991	1992
NIEs												
Hong Kong	35.7	33.3	30.9	31.4	27.7	28.4	28.1	28.4	-8.0	-4.9	-2.8	-3.0
Korea, Republic of	35.6	36.2	36.4	34.9	33.4	36.9	39.1	36.2	-2.2	0.7	2.7	1.3
Singapore	44.1	45.1	45.8	47.2	35.0	39.7	38.2	40.8	-9.1	-5.4	-7.6	-6.4
Taiwan Province of China	30.7	27.9	27.8	26.7	22.8	22.4	22.8	24.4	-7.9	-5.5	-5.0	-2.3
CHINA and MONGOLIA												
China	37.1	40.1	38.9	40.3	38.6	36.6	35.7	39.4	1.5	-3.5	-3.2	-0.9
Mongolia	12.9	3.1	3.5	3.0	46.0	29.9	12.0	10.0	33.1	26.8	8.5	7.0
SOUTH-EAST ASIA												
Cambodia	3.8	3.0	7.7	7.5	11.0	8.3	9.4	9.8	7.2	5.3	1.7	2.3
Indonesia	37.5	37.1	35.7	37.7	35.2	36.6	35.1	35.7	-2.3	-0.5	-0.6	-2.0
Lao People's Democratic Republic	1.1	0.8	2.1	3.6	15.1	14.8	13.1	14.5	14.0	14.0	11.0	10.9
Malaysia	34.0	32.6	31.1	33.8	29.0	32.1	36.3	35.2	-5.0	-0.5	5.2	1.4
Philippines	20.6	18.2	16.1	14.6	21.8	22.5	19.8	21.1	1.2	4.3	3.7	6.5
Thailand	31.1	32.3	33.0	33.1	31.5	38.3	38.2	36.7	0.4	6.0	5.2	3.6
Viet Nam	-0.2	2.1	4.8	6.9	11.6	11.5	11.6	12.0	11.8	9.4	6.8	5.1
SOUTH ASIA												
Bangladesh	2.0	2.2	3.2	4.4	12.2	12.1	10.4	10.4	10.2	9.9	7.2	6.0
Bhutan	-	-	-	-	33.1	33.4	35.6	35.1	-	-	-	-
India	24.6	23.6	24.3	24.3	27.3	26.3	25.5	26.7	2.7	2.7	1.2	2.4
Myanmar	8.8	12.0	13.9	12.5	9.2	13.5	15.1	13.3	0.4	1.5	1.2	0.8
Nepal	9.9	6.1	6.5	6.9	22.1	18.1	20.1	17.8	12.2	12.0	13.6	10.9
Pakistan	10.1	9.8	10.6	11.4	18.9	18.9	18.7	18.7	8.8	9.1	8.1	7.3
Sri Lanka	12.6	13.2	13.0	13.0	22.2	21.2	23.4	23.3	9.6	8.0	10.4	10.3
PACIFIC ISLAND DEVELOPING COUNTRIES												
Fiji	18.2	19.8	16.7	19.0	14.7	19.3	17.3	17.2	-3.5	-0.5	0.6	-1.8
Papua New Guinea	14.3	21.7	16.9	12.9	23.2	24.4	27.4	21.4	8.9	2.7	10.5	8.5
Solomon Islands	-	-	-	-	-	-	-	-	-	-	-	-
Tonga	-	-	-	-	-	-	-	-	-	-	-	-
Vanuatu	5.7	8.8	-	-	37.2	43.6	-	-	31.5	34.8	-	-
Western Samoa	-	-	-	-	-	-	-	-	-	-	-	-

Source: Asian Development Bank data file.

- Note:
1. Newly industrializing economies.
 2. A hyphen (-) indicates that data were not available.

Table 2.3 Selected developing economies of the ESCAP region: Government revenue as a percentage of gross domestic product, various periods

	<i>Average</i> 1970–1971	<i>Average</i> 1980–1981	<i>Average</i> 1990–1991
Newly industrializing economies			
Hong Kong	14.1	21.4	16.9
Republic of Korea	15.3	18.1	18.1
Singapore	21.9	28.0	34.1 ^a
Taiwan Province of China	22.3	14.6	15.2
South-East Asia and China			
China	...	27.0	18.5
Indonesia	13.9 ^b	23.3	20.1 ^a
Lao People's Democratic Republic	...	16.2	10.4
Malaysia	20.7 ^b	26.9	26.0
Philippines	12.4 ^b	12.2	16.9
Thailand	12.4 ^b	14.6	19.4 ^a
Viet Nam	...	25.0 ^c	20.2
South Asia			
Bangladesh	8.6	11.6	16.8
India	10.8 ^d	12.1	14.1 ^a
Myanmar	10.0 ^e	16.5	10.6 ^a
Nepal	5.2 ^b	8.2	7.3
Pakistan	12.3 ^e	16.3	16.9
Sri Lanka	19.0	18.1	18.7
Pacific island economies			
Fiji	20.4 ^b	23.3	28.7 ^a
Papua New Guinea	17.3 ^f	20.7	16.1 ^g
Samoa	...	21.7 ^h	55.5 ⁱ
Solomon Islands	13.8	20.4	12.2 ^g
Vanuatu	...	4.3 ^h	14.4 ⁱ

Source: ESCAP, *Economic and Social Survey of Asia and the Pacific 1991*, (ST/ESCAP/1095), Table II.13, International Monetary Fund, *Government Finance Statistics Tape No. GFS93101F* and Asian Development Bank, *Key Indicators of Developing Asian and Pacific Countries 1992*.

^a 1990

^b 1972

^c 1985

^d 1974

^e 1973

^f 1975

^g 1988

^h 1982

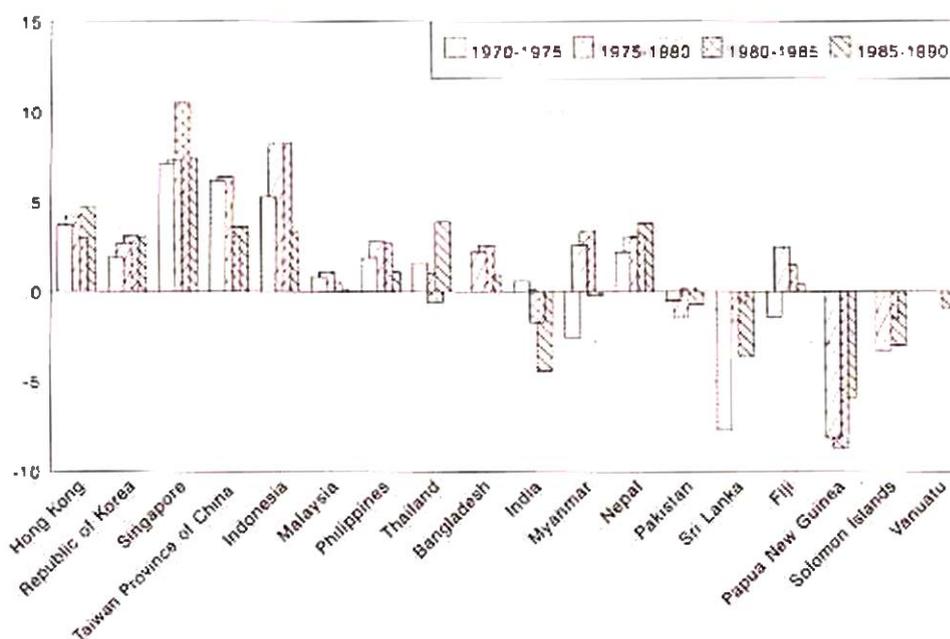
ⁱ 1989

Upward trends in total revenue/GDP, however, are often not accompanied by a commensurate increase in either gross domestic savings or government savings: the latter is defined as the excess of total revenue over government current expenditure. In particular, the rate of domestic savings remained virtually unchanged in South Asia, except notably in Nepal, over the last two decades; also, it has tended to decline in several Pacific island economies. At the same time, there were large government dissavings (India, Papua New Guinea, Sri Lanka, Solomon Islands etc.), and

negligible savings elsewhere (Bangladesh, Fiji etc.).

In sharp contrast, domestic savings have increased steadily, and sharply in several cases, among the newly and nearly industrializing economies during the last twenty years. Their large, previously negative, resource gap between aggregate savings and investment have become positive or relatively insignificant in the early 1990s. Most of these East and South-East Asian economies have also realized substantial government savings amounting to several percentage points of GDP (figure 2.1).

**Figure 2.1 Selected developing economies of the ESCAP region:
Government savings* as a percentage of gross domestic product, various periods**



Source: ESCAP, *Economic and Social Survey of Asia and the Pacific* (ST/ESCAP/1095).

Note: Defined as the excess of government revenue over current expenditure.

The above fiscal patterns carry important implications in the context of infrastructure development. First, increased fiscal efforts are not always sufficient to ensure greater availability of domestic resources for investment, including the provision of investment capital. On the one hand, government savings out of additional revenue can be lower than the marginal propensity to save of the private sector. On the other hand, an increase in government revenue can often be dissipated largely through higher current outlays, resulting in negligible extra savings.⁴

Second, there exists no simple yardstick as regards the optimal level of tax efforts in relation to the needs of growth and transformation, including the provision of infrastructure prerequisites. Nevertheless, the better infrastructure base in the newly and nearly industrialized economies of East and South-East Asia must have been facilitated by, among other things, their comparatively larger tax

and public savings efforts. In that context, it should be noted that the historical ratios of total revenue/GDP have not reached excessive proportions in many of the developing ESCAP economies. The ratios realized by several South and South-East Asian economies, for example, are considerably below the region's average range; they are also well below those achieved by their counterparts outside the region in the sub-Saharan and Caribbean subregions.⁵

There is thus appreciable room for greater tax efforts in a large part of Asia. In particular, the current degrees of buoyancy and elasticity of the tax system can be much enhanced through a judicious widening and deepening of the tax base. Such options necessarily will have to be balanced by taking due account of the adverse impact on private incentives and the capacity of Governments to translate higher tax revenues into higher public savings.

At the same time, the potential for greater efficiency in the fiscal system remains far from exhausted, even in the upper middle-income economies. Fiscal instruments can be better designed and innovations, such as value added taxation, can be

⁴ These possibilities underline the so-called 'Please effect'. See S. Please, 'Saving through taxation - reality or mirage?', *Finance and Development*, vol. IV, No. 1 (March 1967), pp. 24-32; and 'The Please effect revisited', *Economics Department Working Paper No. 82*, International Bank for Reconstruction and Development, Washington D.C., (1 July 1970); ESCAP, *Economic and Social Survey of Asia and the Pacific 1982*, pp. 122-140; and *Economic and Social Survey of Asia and the Pacific 1984*, pp. 157-160.

⁵ World Bank, *World Development Report 1988* (New York, Oxford University Press, 1988), pp. 80-83.

Box II. TAX REFORM IN THAILAND

Beginning in the fiscal year 1988, the Government actively pursued a tax reform policy aimed at restructuring the national economy in line with its broad goals of development. Based on the principle of a market economy, tax reform measures were designed to improve the economy's productive efficiency and competitiveness in foreign markets, as well as to create a favourable environment for investment by streamlining the tax system and increasing tax neutrality. Because of the strong fiscal position of the Government at the time the reform was launched, the reform did not impose too much of a burden.

Measures that have been taken include:

1. A restructuring of income taxes

In order to reduce the tax burden and promote saving and investment, the personal income tax structure has been streamlined several times since 1 January 1989. The change to date includes higher personal allowances and deductible expenses and the rationalization of the income tax structure from 11 income tax brackets (ranging between 7 and 55 per cent), to 5 income tax brackets (ranging between 5 and 37 per cent), thus making Thailand's personal income tax rates more comparable with those in neighbouring countries.

As for corporate income tax, the rate for unlisted juristic companies was reduced from 35 to 30 per cent, the same rate as applied to companies listed on the Stock Exchange of Thailand (SET) as of 1 January 1992, to ensure equitable tax treatment.

2. A restructuring of customs tariffs

To boost productive efficiency, international competitiveness and investment, as well as to prepare for the increasingly competitive global environment characterized by increased integration and liberalization, Thailand's import tariffs rates are set to be reduced to six main rates, namely, 0, 1, 5, 10, 20 and 30 per cent, except for completely-built automobiles which will be taxed at two higher rates of 42 and 68.5 per cent. To this end, measures to modify the tariff structure that have been implemented include reductions in import duties on 419 categories of machinery and capital equipment to 5 per cent, effective from 19 September 1990, reductions in import duties on automobiles and parts, effective from 3 July 1991, and the restructuring of import tariffs on ore, iron and steel products, and on products of the chemical industry, totalling 1,516 items, effective from 1 January 1993.

3. Tax reform on financial instruments

To support the development of financial instruments with a view to improving the effectiveness of savings mobilization, on 7 November 1991, taxes on financial instruments were streamlined to reduce the burden of repetitive taxes and to increase tax neutrality. Therefore, taxes on interest income were reduced from 6 to 3 brackets, taxes on dividend to 2 brackets, and those on capital gains from 4 to 2 brackets.

4. Value added tax (VAT)

Beginning 1 January 1992, VAT was adopted to replace the business tax which had several drawbacks, the major ones being: (a) the complexities of applying as many as 21 tax rates, in the range of 0.5 to 50 per cent of turnover while business was classified into numerous sub-categories, which made it difficult to understand the tax structure and opened up an opportunity to avoid tax payments; (b) the repetitive nature of tax collection which was levied on incomes at all stages of production, resulting in unfair tax treatment, particularly between single-stage producers and multi-stage producers, in encouraging vertical integration as a means of reducing tax burden, and leading to monopoly and economic inefficiency; and (c) a problem of calculating and returning taxes to exporters. To address these problems, the Government introduced a value added tax with a unified rate of 7 per cent being applied to all stages of production and distribution. The tax is expected to be more conducive to promoting production, investment, and export.

5. Tax measures to promote the international banking business

In line with the Government's policy to develop Thailand into a trade, investment and financial centre in the region with a view to encouraging regional trade and investment following the economic reconstruction of the Indochinese countries, and to improving the competitive edge of Thai financial institutions at the international level, the Ministry of Finance and the Bank of Thailand announced, on 16 September 1992, the establishment of the International Banking Facilities (IBF). Subsequently, on 22 September 1992, two Royal Decrees were issued by virtue of the Revenue Code to induce more business in the IBF. According to the Decrees, corporate income tax on IBF was reduced from 30 to 10 per cent, and withholding tax on interest income from deposits and loans, specific business tax, and stamp duty were exempted.

Source: Mongkolsmai, Dow, *Savings Mobilization in Thailand*, paper prepared for Socio-Economic Dialogue on Macroeconomic Management and Regional Cooperation, United Nations Development Programme Subregional Programme for Cambodia, Lao People's Democratic Republic, Thailand and Viet Nam

more widely introduced in accordance with the available administrative capabilities.⁶ Moreover, the assignment of additional resources to minimize tax avoidance and ensure greater compliance will likely yield high returns. All these above options have long been advocated in the context of fiscal adjustments and reforms in Asia and the Pacific; they are still of considerable relevance at present.⁷

2. Public sector self-financing

The financial viability of development and maintenance programmes for investment capital can also be enhanced by charging rational prices and levies on the pertinent facilities and services. This course of action is essential for allocative and internal (cost) efficiency in the absence of market competition; as often is the case with infrastructure provision. Such a practice may not always involve a trade-off (or conflict) between the objectives of economic efficiency and distributional equity - given persistent resource constraints faced by Governments and, prevailing inequities in the access to and coverage of infrastructure, as already discussed.

A basic criterion of price determination is that the price of a good or service should be equated to its marginal cost of production. If price is lower than marginal cost, there would be excess demand. In the case of infrastructure provided by Governments, this would also involve substantial government subsidies with an efficiency-distorting impact on other sectors and activities.

⁶ Various forms of value added taxation have been introduced in several countries of the region.

⁷ A. Bagchi, 'Tax reform in developing countries: agenda for the 1990s', *Asian Development Review*, vol. 9, No. 2, (1991), pp. 40-72.

The overall costs of production at the margin should include, as appropriate, imputed elements of resource rent or depletion, of negative intersectoral externalities, the risks associated with future disasters as well as forgone benefits of future generations or users of resources. In practice, however, there are serious difficulties in the concept and valuation of all elements of the cost of infrastructure, especially intersectoral and intergenerational costs.

As a practical rule, it is often argued that the prices or charges of infrastructure facilities and services should be sufficient to cover both operating (especially repair and maintenance) and fixed costs (including those of debt service) of the specific facility provided; they should also provide a margin for future investment or upgrading needs. There is, however, sometimes the risk that user charges could be set at levels which will cross-subsidize the provision of additional discrete, but complementary, infrastructure. There may be adverse equity and distributional consequences arising from fixing user charges for both old and new infrastructure at the level necessary to cover the cost of the new.

The application of the above self-financing criteria has encountered many difficulties, several of which arise from the inherent characteristics of the investment capital itself. The existence of external benefits or costs, for example, may necessitate a commensurate adjustment in prices and levies. In cases of significant economies of scale (i.e., decreasing marginal cost), setting prices and charges on the basis of marginal costs would imply that costs cannot be covered through revenues owing to the excess of average unit cost over that of marginal cost. Despite difficulties in the application of ideal principles for determining prices

of infrastructure, there are reasons to believe that there is a considerable scope, as well as need for, greater recovery of costs through higher levies and charges on users or beneficiaries of many facilities and services in most parts of the developing ESCAP region. A practical example of the development of financial and economic objectives, including pricing, in the United Kingdom of Great Britain and Northern Ireland appears at annex I.

The low rates of government savings out of additional tax revenue was discussed earlier. An important causal factor behind this budgetary pattern concerns public sector enterprises, many of them directly engaged in the provision and management of infrastructure. Far from being a source of non-tax revenue, a large number of these undertakings have been a net drain on the government budget. They have incurred sizeable operating losses or have not been able to meet the burden of debt service. Most of these enterprises are also accorded privileged access to domestic capital markets and, not infrequently, to external borrowings on concessional terms as well as to debt forgiveness or write-off by Governments; all these imply a large, implicit subsidy with adverse effects on other domestic sectors and activities.

It is notable that many electrical power companies, typically the largest government-owned single enterprise in most economies, demonstrate an unfavourable and often deteriorating financial performance: among the major exceptions in the region are those operating in Hong Kong, Malaysia and Singapore. A detailed study indicates that generally the self-financing ratio, that is, internal retained funds relative to investment requirements, as well as the financial rates of return of these companies have fallen considerably since the 1970s.⁸

In varying degrees, public authorities involved in the provision of other facilities and services, notably water supply, various modes of transport and communications etc. have also encountered considerable financial difficulties. These problems have compounded over time to impact adversely on the quality of the facilities and services provided. Excessive staffing and distribution losses, cutbacks in operations, poor maintenance and revenue collection, and outdated technologies have in turn led to a vicious circle of lower consumer use, reduced financial viability, and declining quality of services in many cases.

⁸ World Bank, *World Development Report 1988*, pp. 142-143.

In the water supply sector, a survey undertaken by ESCAP of member countries regarding funding levels and cost recovery showed that only a few countries were able to recover the costs of capital investment for their urban water supplies, and many were able to recover fully only the costs of operation and maintenance. Cost recovery was at even worse levels for rural water supplies, with only very few countries reporting an ability to recover fully the costs of operation and maintenance.

A major reason behind unfavourable financial results is generally attributable to the perceived trade-off between cost efficiency and distributive equity. Many of the facilities and services provided are subsidized by Governments to ensure adequate access to the poor and other less privileged segments of the society; after all, a large number of them can be regarded as merit or public goods in themselves (for example, water supply, electrical power, bus and rail transport etc.). Nevertheless, for a variety of reasons, equity in coverage has not been achieved in many cases.

There is considerable evidence that across-the-board subsidies have resulted in highly uneven access to, and wasteful uses of, many infrastructure facilities and services. A typical example is irrigation water. The provision of this resource free of charge or at low cost, has tended to benefit farmers who are large consumers or are close to the supply sources. This practice has also led to excessive or uncontrolled usage. Coupled with inadequate drainage systems and unlined water conduit channels, this has resulted in serious water logging and soil salinization in several countries of the region.⁹

Thus, it appears possible to raise non-tax revenue, rationalize demand, improve delivery efficiency and enhance equity of access through higher fees for infrastructure users or charges on beneficiaries across a wide range of overhead facilities and services. These adjustments apply particularly to infrastructure utilized mostly by well-off social groups, conferring large private benefits or prestige, and/or subject to fairly inelastic or persistent excess demand. The facilities and services exhibiting some of these characteristics include air transportation, certain modes of radio/video transmission through public facilities, cellular/mobile telephones etc.

⁹ ESCAP, *Economic and Social Survey of Asia and the Pacific, 1990* (ST/ESCAP/949), pp. 196-197; and ESCAP, *State of the Environment in Asia and the Pacific 1990* (ST/ESCAP/917).

Likewise, there are consumers who are prepared to pay for the connection of electrical power, piped water and sewage services. Nevertheless, their services tend to be heavily subsidized, with larger and richer consumers benefiting the most; most of the urban poor and the bulk of rural population have limited access to these services. Subsidies have also contributed to the low rates of financial returns of many public utilities in spite of strong pent-up demand. This unfavourable outcome has severely constrained expansion programmes because of the consequent lack of internal funds and the massive budget subsidies involved.

Another equally important issue relates to the frequency of rate adjustments to reflect closely the trends in operational expenses and/or investment needs. Increased charges for public utilities almost invariably are a sensitive political matter. Yet delays in passing on the higher costs of inputs or systematic expansion will threaten the financial viability and quality of the facilities and services concerned, unless a commensurate subsidy is forthcoming from the budget which, in turn, may necessitate an across-the-board and distortion-inducing tax. An allied consideration is the need for more effective metering, billing and collection of arrears; often the major delinquent customers are government departments and state enterprises themselves. At the same time, however, there is also much room for improvement in financial control and management accountability of the infrastructure authorities concerned.

Road and congestion pricing, betterment taxes for the establishment or enlargement of overhead capital, separate metering and billing services (for example, electricity, gas, water, port) are appealing in principle. Hong Kong and Singapore, for example, have been remarkably successful in the combined application of pricing and regulation to minimize motor vehicle traffic congestion. The general experience, however, has revealed substantial difficulties in large-scale application. For these reasons many authorities have found infrastructure pricing and charges suitable not only for decentralized operation but also for involvement by local governments.

When costs are largely borne by the users or beneficiaries themselves, services tend to be more flexible, relevant and efficiently delivered. Again, adequate administrative capabilities and transparency at the local levels are a *sine qua non* for success in the equitable and efficient provision of infrastructure as well as other public services by local authorities. With few exceptions, however,

effective local administration has been hampered by an acute lack of finance and technical skills. Yet the potential contribution of local government authorities to raising the overall efficiency and relevance of overhead capital can be considerable and deserves appropriate attention.

C. OVERSEAS FUNDING

1. International lending agencies

The two principal international agencies lending to countries in the ESCAP region are the World Bank and the International Development Association (IDA) and the Asian Development Bank (ADB). In 1992, the World Bank and IDA entered into new loan commitments totalling \$21.7 billion, of which around \$5.0 billion was committed to the infrastructure sectors: power, seaports, telecommunications, transport, urban transport and water in ESCAP member countries. The total new operations approved by the ADB in 1992 amounted to \$5.1 billion. Of this total, around \$2.5 billion was lent for the same infrastructure sectors listed for the World Bank. Although both of these organizations are making significant contributions to economic development of countries of the region, the scope for dramatic expansion is obviously limited.

2. Foreign direct investment (FDI)

External savings supplied in the form of FDI and commercial loans have become very important to many economies in the developing ESCAP region; for several of them, these private flows rather than official development assistance constitute the bulk of supplementary resources. FDI is, of course, not the only means of access to external technologies, organizational innovations, and markets for the development and management of overhead facilities and services. It is, however, a risk-sharing method which does not generally involve any sovereign financial guarantee or commitment. Besides, FDI because of its underlying profit motivation, usually only finances viable projects.

The total amount of FDI has expanded rapidly so that the inward flow into developing economies of the ESCAP region stood at just over \$20 billion in 1991, compared with some \$22 billion in net official transfers. In contrast, the average annual level of inward FDI had been around \$2 billion during the period 1975-1980, relative to an ODA inflow of \$6 billion in 1975 (tables 2.4 and 2.5). Borrowings from the international markets by the region's

Table 2.4 Annual average net foreign direct investment flows and their distribution within the developing Asian and Pacific region, 1975-1991
(millions of US dollars; percentage)

	Average 1975-1980		Average 1980-1985		Average 1985-1990		1991	
	Amount	Percentage	Amount	Percentage	Amount	Percentage	Amount	Percentage
Newly industrializing economies	895	45	1997	41	5795	48	6932	35
Hong Kong	241	12	562	12	1667	14	961	5
Republic of Korea	61	3	116	2	602	5	1116	6
Singapore	502	25	1130	23	2647	22	3584	18
Taiwan Province of China	91	5	189	4	879	7	1271	6
	973	48	2447	51	5689	47	12479	62
China	---	---	796	17	2654	22	4366	22
Indonesia	290	14	229	5	551	5	1482	7
Malaysia	524	26	1083	22	1054	9	4073	20
Philippines	74	4	58	1	413	3	544	3
Thailand	85	4	280	6	1017	8	2014	10
South Asia	89	4	179	4	346	3	512	3
Bangladesh	0	0	0	0	2	0	1	0
India	41	2	62	1	139	1	149	1
Pakistan	33	2	75	2	168	1	257	1
Sri Lanka	15	1	42	1	38	0	105	1
Pacific island economies	15	1	135	3	165	1	121	1
Fiji	10	1	31	1	22	0	7	0
Papua New Guinea	---	---	98	2	130	1	77	0
Solomon Islands	5	-	1	-	5	0	19	0
Vanuatu ^a	---	---	5	1	9	0	18	0
Other regional economies	36	2	70	1	32	0	---	0

Sources: United Nations, *Transnational Corporations in World Development: Trends and Prospects* (ST/CTC/89), pp. 5-6; Organisation for Economic Cooperation and Development, *Geographical Distribution of Financial Flows to Developing Countries*, various issues; World Bank, *World Debt Table 1990-91*, vol. 2, *Country Tables* (Washington D.C., 1990); United Nations, *World Investment Report 1992*, and 1993; and national sources.

^a 1982-1985

economies amounted to \$18 billion in 1991, compared with \$12 billion in the early 1980s and \$15 billion in 1985.¹⁰

The distribution of inward FDI and commercial loans tends to be highly uneven. In 1991, for example, over \$14 billion or some 70 per cent of the invested resources was channelled to only four countries, namely China, Malaysia, Singapore and Thailand. The total flows to the eight dynamic economies of East and South-East Asia accounted on average for 91-94 per cent of all inward FDI to the developing ESCAP region between 1980-1991 (table 2.4).

¹⁰ Asian Development Bank, *Key Indicators of Developing Asian and Pacific Countries* (Manila), various issues.

India and Pakistan made considerable use of international capital markets, particularly in the second half of the 1980s. In general, however, most commercial lending in the early 1990s was made to East and South-East Asian economies, notably China, Indonesia, the Republic of Korea and Thailand. Papua New Guinea is relatively unique among smaller countries as the destination of appreciable amounts of both FDI and commercial loans for mineral resource development during most parts of the last decade and the early 1990s.

Although details are not available, the share of FDI and commercial credit channelled directly for infrastructure development is by and large minor in relation to the total inflow. Most conspicuously, privately sourced external finance has supported the establishment, upgrading and extension of telecommunication facilities, of tollways and port

Table 2.5 Destination and relative importance of ODA inflows, 1971-1990
(Annual averages)

	1971-1975		1975-1980		1981-1985		1985-1990		1991	
	Millions of dollars	Percentage of GDP	Millions of dollars	Percentage of GDP	Millions of dollars	Percentage of GDP	Millions of dollars	Percentage of GDP	Millions of dollars	Percentage of GDP
East and South-East Asia										
China	---	---	---	---	681.76	0.29	1714.54	0.55	2076.20	0.69
Hong Kong	1.42	0.03	5.98	0.02	12.10	0.04	27.76	0.05	36.10	0.04
Indonesia	612.68	3.71	697.98	1.52	780.42	0.87	1434.96	1.46	1877.30	1.61
Lao People's Democratic Republic	62.82	---	45.54	---	34.82	1.56 ^a	94.02	9.77	143.30	14.04
Malaysia	61.80	0.85	94.96	0.64	202.20	0.67	253.62	0.73	289.00	0.62
Philippines	159.46	1.42	237.20	0.98	396.14	1.19	915.10	2.29	1055.20	2.33
Republic of Korea	294.80	2.22	178.76	0.56	65.48	0.10	21.52	0.01	54.70	0.02
Singapore	24.16	0.67	10.34	0.15	24.36	0.15	33.30	0.14	7.80	0.02
Taiwan Province of China	-9.66	-0.06	0.48	-0.02	1.06	0.00	2.58	-0.00	3.40	0.00
Thailand	67.40	0.62	274.60	1.01	429.58	1.14	597.52	1.04	721.00	0.78
South Asia										
Bangladesh	440.00	5.39	947.08	9.86	1163.00	9.02	1748.10	9.11	1889.60	8.62
India	1092.52	1.34	1552.88	1.33	1731.66	0.88	1767.98	0.68	2767.00	1.03
Nepal	33.50	3.01	101.38	5.55	202.58	8.64	398.42	13.42	453.20	16.03
Pakistan	517.82	6.33	854.42	5.51	782.66	2.75	1133.56	3.06	1371.30	3.19
Sri Lanka	85.48	2.67	277.72	7.48	438.36	8.36	601.94	8.43	890.10	9.88
Pacific island economies										
Fiji	13.62	3.00	28.02	3.11	34.36	2.92	45.24	3.59	44.70	62.18
Papua New Guinea	220.64	20.45	280.48	15.38	311.34	12.15	340.18	10.53	396.80	10.47
Samoa	5.56	---	21.62	---	22.72 ^b	22.21 ^b	33.34	25.86	56.30	37.43
Solomon Islands	13.10 ^c	25.12	26.86	26.85	25.44	16.63	48.00	26.37	35.00	19.99
Vanuatu	9.40	---	29.36	---	25.92	22.74 ^b	40.88	28.26	52.60	30.84

Sources: ESCAP secretariat estimates based on Organisation for Economic Cooperation, *Geographical Distribution of Financial Flows to Developing Countries*, various issues; International Monetary Fund *Tape No. 93323F*; International Monetary Fund, *International Financial Statistics*, various issues and World Bank, *World Debt Tables 1992-1993*.

^a 1985.

^b 1982-1985.

^c 1972-1975.

facilities etc., especially in East and South-East Asia. Telecommunications in Cambodia and Viet Nam, for example, entered the digital age a few years back primarily with the support of private capital; the installed systems and their subsequent expansion also represent a significant technological leapfrog in the circumstances of those two countries.

The importance of external private savings in infrastructure development can be expected to increase in future. A number of economies in the region have graduated away from concessional ODA financing; indeed, some of them enjoy high credit worthiness enabling them to raise significant amounts from the increasingly competitive international capital markets. Moreover, the continuing reassessment of the role of Governments in infrastructure is also likely to create a favourable climate for foreign private sector involvement. The experience, however, has also indicated that the greater participation of FDI and commercial lending is fraught with many difficulties.

3. Official development assistance (ODA)

The flows of official development assistance, in absolute terms, have tended to concentrate on larger and more populous countries. For example, the highest ODA flows in 1991 were to China (\$2.1 billion) and India (\$2.8 billion) (table 2.5). In contrast, the flows of ODA to island countries in the Pacific are very small, although the levels of aid per head of population, ranging from \$500 up to some \$3,000 a year in the late 1980s, are among the highest in the world. The main exceptions to the above pattern are those of Fiji and Papua New Guinea, the two largest island countries.¹¹

The extent of dependence on ODA has also changed over time. Presently, foreign assistance is equivalent to a relatively large proportion of GDP of the disadvantaged groups of economies in the region, with few exceptions. The ratio ODA:GDP was around 30 per cent in smaller Pacific island economies during the second half of the 1980s; it ranged from 8-14 per cent in several least developed and other Pacific island countries, and also in Sri Lanka. For most other developing countries in the region, however, ODA accounts for less than a percentage point of GDP (table 2.5).

¹¹ ESCAP, *Economic and Social Survey of Asia and the Pacific 1989* (ST/ESCAP/820), pp. 145-146.

In terms of composition, ODA has constituted the large bulk of net financial transfers to the least developed and Pacific island countries except notably Papua New Guinea which is the host to much foreign direct investment (FDI) in mineral resource development. ODA is also by far the most important source of foreign savings in China, India, Indonesia, Pakistan and the Philippines. However, China and Indonesia also receive a large amount of FDI. In contrast, FDI and other commercial capital generally account for most of the inflows of external savings in the newly industrializing economies (NIEs) and, to a lesser extent, Malaysia and Thailand as well.

ODA, including grants and concessional lending from bilateral and multilateral sources, is likely to have played a major role in infrastructure development in the region. Globally, aid for economic infrastructure, consisting largely of transport and communications, and energy facilities and services, accounted for 16-17 per cent of bilateral aid during the period 1985-1990. The same category of overhead capital, however, received the largest share of multilateral funding, about one third, during the same period. The major focus of such funding was on energy infrastructure (table 2.6).

ODA, as a source of financing infrastructure, is likely to remain appealing to most developing economies for the foreseeable future. Such external aid is for the most part available on highly concessional terms.¹² As such, it is the most suitable modality for the financing of lumpy and/or long-gestation infrastructure. Besides, the inherent characteristics of infrastructure together with other less favourable "initial conditions" in many low-income countries have rendered infrastructure less attractive for private investment, whether from external or domestic sources.

¹² In the early 1990s, for example, the maturity periods of new ODA loans ranged from 20 years to upwards of 30 years for low income and other disadvantaged economies in the region. These economies were also accorded a very high grant element and concessional interest rates; the grant element averaged some 75 per cent of new aid inflows in the case of least developed countries. The grace period before debt service, generally around 5-6 years, was extended to over 10 years for the least developed countries. See Asian Development Bank, *Key indicators of Developing Asian and Pacific Countries 1992* (Manila), pp. 64-68.

**Table 2.6 Breakdown of aid by major purposes (commitments),
average 1985-1986 and 1989-1990**
(Percentage of total)

	Average 1985-1986		Average 1989-1990	
	Total bilateral finance ^a	Total multilateral finance	Total bilateral finance ^a	Total multilateral finance
Social administrative infrastructure	24.4	20.2	23.7	25.5
Education, health and population	16.2	13.9	14.9	10.7
Planning and public administration	2.2	0.5	2.8	4.4
Others ^b	6.0	5.8	6.0	10.4
Economic infrastructure	16.5	34.3	17.7	33.2
Transport and communications	8.1	15.6	10.0	12.6
Energy	5.1	18.7	5.7	14.8
Others	3.3	-	1.9	6.0
Production	21.3	32.8	14.9	28.8
Agriculture	12.5	22.1	8.8	15.5
Industry, mining and construction	5.6	7.5	4.5	10.1
Others ^c	3.2	3.2	1.8	3.3
Multisector	2.5	-	3.0	0.6
Others ^d	35.3	12.7	40.8	12.1
TOTAL	100.0	100.0	100.0	100.0

Source: Organisation for Economic Cooperation. *Development Cooperation*, various issues.

^a Includes data only for countries belonging to Development Assistance Committee.

^b Including water supplies.

^c Including trade, banking, finance and tourism.

^d Including programme assistance, debt relief, food aid, emergency aid and unspecified allocations.

D. PROSPECTS OF RESOURCE FLOWS AND RELATED POLICY IMPLICATIONS

There is no doubt that huge amounts of capital will be required for the provision, expansion, upgrading, and/or repair and maintenance of infrastructure facilities and services in the region. Conservative secretariat estimates referred to earlier which cover the cost of infrastructure development and expansion alone, without taking into account upgrade or maintenance requirements, amount to around \$1,400 billion over the remaining part of the decade.

There would appear to be a number of constraints on the scope for expansion of funding from foreign sources which must give rise to considerable uncertainty as to developing countries' access to external resources, particularly ODA. One element of this uncertainty is the emergence of new

claimants. The net financial flow to countries of the former Soviet Union was about \$9 billion in 1991 and is projected to reach almost \$21 billion in 1992. Similarly funds channelled to Eastern Europe are expected to more than double to \$6 billion between 1991 and 1993.

Additionally, the excess savings from traditionally surplus countries (Germany and Japan in particular) and the newly emerging creditor economies in East and South-East Asia are shrinking. After an exceptionally long period of relatively vigorous expansion, several major Organization for Economic Cooperation (OECD) countries are experiencing economic difficulties of varying seriousness in the early 1990s. Aggregate output from industrial countries, for example, increased by an average of around 1 per cent annually in 1991-1993, compared with a yearly average of 3.4 per cent in 1988-1990. Similarly, economic growth in the dynamic East and South-east Asian subregions has decelerated in the early

1990s (relative to the late 1980s) although the rates of expansion remain markedly higher than those of OECD members. The relatively healthy surpluses on the external current accounts of the NIEs have also fallen noticeably during the same period.¹³

These conflicting undercurrents concerning global demand for and supply of savings in combination with the past experience that any large sustained increase in ODA to some countries tends to lower significantly the resources available to the others, could raise the cost of external finance and limit access to developing countries of the region. Several implications follow from these possibilities.¹⁴

The constraints on foreign funding sources will place greater importance on the need for the countries of the region to explore and tap the full potential available for domestic resource mobilization, both through fiscal and non-fiscal measures, and through increased private sector participation. There is appreciable room for greater efforts in taxation both in terms of the rate and scope of collection and the efficiency with which the collection process occurs.

Countries should also examine the possibilities of raising non-tax revenue, rationalizing demand, improving delivery efficiency and enhancing equity of access through the introduction of charges for infrastructure services which reflect the cost of development and operation of those services. Adjustment of rates charged should also reflect trends in operational expenses and investment needs. In this context the structure of the organizations delivering infrastructure services should also be examined for appropriateness in terms of prospects for competition and improved efficiency by the introduction of appropriate commercial practices. The removal of effective subsidies would also remove pressures on the government budget process providing opportunities for increased government savings.

With the financial position of many developing countries improving and levels of disposable income increasing through sustained economic growth, their financial sectors need to develop to maximize abilities to achieve domestic capital

raisings. In Lao People's Democratic Republic, for example, total savings are reported to have risen as a percentage of GDP from 0.96 per cent in 1989 to 5.5 per cent in 1991. In response to rising demand for banking services a Commercial Bank and Financial Institutions Act was introduced in 1992 which gave the Bank of the Lao People's Democratic Republic powers to regulate all national financial institutions and authorize new commercial banking ventures. These developments have also seen the entry of foreign banks into Lao People's Democratic Republic.¹⁵

In the event that countries do experience funding shortfalls there will be increased pressure on the infrastructure planning process and on maximizing returns from utilization of those funds available. This implies that a great deal of care would need to be exercised in the choice of infrastructure projects by rigorously weighing the development and planning priorities. In particular greater attention than has occurred in the past will need to be paid to technology choice in a whole range of critical infrastructure development projects such as in water power, telecommunications and transport with a view to ensuring that they are cost-effective and minimize dependence on imported inputs and skills. In this context the development of human resources and adjustments within an institutional framework to efficiently implement and operate completed projects has to receive high priority.

The above measures on the part of developing countries will have to be complemented by supportive actions on the part of donor countries and organizations. One of these relates to the need for ensuring stability and predictability of the annual inflows, particularly of ODA. Although narrowing, the gaps between ODA disbursement and commitment have been sizeable, clustering around 70-80 per cent in the late 1980s. Unplanned under disbursement tends to generate large overruns of project costs, aggravates implementation problems through underutilization of local counterpart funds, and of related facilities such as distribution networks, transmitting stations, and storage space. Hence, there is a great need for improving the disbursement process of ODA.

It is well recognized that ODA has to be appropriated annually in donor countries. This technical requirement, however, is unlikely to be insurmountable given the spirit of understanding between the donor and recipient countries. The

¹³ ESCAP, *Economic and Social Survey of Asia and the Pacific 1992* (ST/ESCAP/1243), pp. 2-5; and Asian Development Bank, *Asian Development Outlook 1993*, pp. 258 and 272-273.

¹⁴ S.M. Collins, *Capital flows to developing countries: implications from the economies in transition*, *Proceedings of the World Bank Annual Conference on Development Economies 1992* (Washington, D.C., the World Bank, 1992), pp. 349-369.

¹⁵ Economist Intelligence Unit, *Country Report No 1, 1993*, page 36.

possible options, if widely adopted, could greatly enhance the effective programming of infrastructure projects, which typically involve long gestation

periods, and of their maintenance and operations. In turn, this would serve to maximize the utility and contribution of ODA.

Chapter III

POLICY OPTIONS FOR IMPROVED MANAGEMENT OF INFRASTRUCTURE

In recent years most of the emphasis in discussion on infrastructure in the region has been on infrastructure shortages and development. However, as more infrastructure becomes available it is being increasingly realized that greater emphasis has to be placed on the effective and efficient management and maintenance of that infrastructure if its maximum long-term utility and productivity is to be achieved. Improved management and maintenance can also avoid or at least reduce the need for further investment against a background of possible development capital shortfalls.

The management responsibilities that arise cover a range of issues including planning, direction and operation associated with both human and physical resources. Moreover, this management process often takes place against a background of political and economic evolution. The task for managers then is not an easy one, especially when the managers themselves are new to the process.

A number of areas of infrastructure have been examined in more detail below to demonstrate the task and the issues confronting the new infrastructure managers of the region.

A. ELECTRICAL POWER SUPPLY

1. Management of power utilities

The performance of Asian and Pacific power utilities is as varied as the size of the utilities and as the performance of the economies in the region. Some are performing extremely well, but many are not. According to ADB, many of the utilities are operating with less than 10 per cent rates of return, have debt-equity ratios of near to 0.5 or even above and have operating ratios of above 0.5. While most utilities obtain sufficient revenue to cover their operating costs, the basic problem is their inability to earn a surplus for investment. This is in the main due to low average tariffs which are either set by government decree or determined by parliamentary commissions. These range from only 4 to 6 US

cents per kWh, compared with long-run marginal costs of 4 - 5 US cents per kWh for generation costs only (i.e., not yet including transmission and distribution costs and other overheads), based on large size coal-fired plants¹.

However, the "inefficient" management of some power utilities cannot in fairness be blamed solely on the managers of the utilities, but can be attributed to the operating environment provided by the developing countries². Many utilities work under the constraint of government surveillance (and, often, intervention) and have to serve customers in vast areas with low and uneven loads³.

2. Deferring/reducing the investment requirement

Some deferment or reduction in the electrical power investment requirement could be anticipated if countries were able to improve the operating efficiency of existing infrastructure (including reducing transmission and distribution losses) or changing the pattern or rate of growth of user demand.

The rate of demand growth in many developed countries has been moderated, in particular, by initiatives such as consumer education (for example, encouraging consumer use of efficient electrical goods), alternative power sources (such as solar hot water heating), and hierarchical tariff

¹ It should be noted that most of the island countries were able to obtain much higher revenues per kWh, but their utilities were small. The 1990 weighted average revenue for ADB's DMCs in constant 1985 US cents per kWh were: 3.45, 4.79 (excluding China), and 5.10 (excluding China and India).

² It is misleading to characterize the high intensity of electricity consumption of developing countries as evidence of their inefficient electricity consumption, just as it is misleading to say that the high energy intensities of developing countries are a reflection of their inefficient energy consumption. These intensities are merely ratios, and they are high for developing countries because their GDP's, and the share of manufacturing in GDP, are still low.

³ Indonesia's utility, PLN, for instance, supplies electricity throughout the archipelago in more than 200 separate systems, many of them consisting of only one diesel plant serving a small city in isolation and operated only for about 6 hours in the evening. Thus high overhead costs and inefficient power generation are inevitable, and also high capital costs as well as underutilization (low capacity factor) of equipment. In addition, low purchasing power of customers does not allow surplus revenues.

structures (where unit costs increase with usage). Similarly, reductions in peak demand have been achieved through the introduction of lower tariff off-peak services.

Consumer education encourages consumers to use more efficient lighting, appliances and other equipment. These include compact-fluorescent lamps, high efficiency air-conditioners with frequency control, high efficiency freezers and refrigerators etc. In industrialized countries many utilities have adopted and implemented demand-side management programmes and several developing countries are embarking on such programmes.

Thailand is about to embark on such a programme. A law was enacted in 1992 (the Energy Conservation Promotion Act) to set up an Energy Conservation Fund based on tax revenues on gasoline sales and contributions from industry. The Fund will be supplemented by a loan from the Global Environment Facility⁴ and will be utilized to finance the demand-side management programme which is to be implemented by the Electricity Generating Authority of Thailand, the utility responsible for the generation and transmission of electricity in Thailand, together with the other two utilities (Metropolitan Electricity Authority and Provincial Electricity Authority), as well as the Department of Energy Development and Promotion. The programme will channel almost \$200 million⁵ over a period of four years to electricity consumers in the commercial, industrial and domestic sectors to enable the installation of energy-efficient lighting, equipment and appliances. It is estimated that by the end of this period a total of 238 MW of newly installed capacity and 1,427 GWh would be saved⁶.

Other countries of the region are also interested in formulating and implementing similar programmes on demand-side management and are watching with great interest the progress in Thailand. India, Indonesia and Malaysia are undertaking preparations to implement demand-side management, although no applications have been forwarded for loans from the Global Environment Facility.

⁴ The \$9.5 million project is entitled "Electricity Energy Conservation" and includes \$4 million Swiss co-financing.

⁵ The amount in Thai baht is 4,700 million.

⁶ These figures were obtained from the Energy Conservation Center of Thailand (ECCT).

B. WATER SUPPLY AND WASTE TREATMENT

1. Deferring/reducing the investment requirement

According to secretariat estimates the investment levels allocated to the water supply and sanitation services sector in the region between 1980-1990 need to be more than doubled to reach 85 per cent and 75 per cent coverage levels respectively by the year 2000.

Some deferment or reduction in the urban water supply investment requirement could be achieved if the countries were able to improve the operating efficiency of the existing infrastructure, particularly in large cities. Considerable water savings may be achieved by reducing leakages and poor consumption practices. Leak detection programmes in Bangkok and Manila, for example, have led to a greatly decreased quantity of unaccounted-for water usage, allowing for the postponement of construction of new facilities. Water pricing, including effluent charges, are also an important instrument for stimulating efficient use of water in the household and at commercial establishments.

2. Cost recovery and demand side management

Water requirements of industry and other users could be significantly reduced by water pricing and effluent charges, aimed at reducing water requirements and recycling water. Through enforcing effluent standards and providing subsidies to reduce waste loads, pollution levels could also be significantly reduced. The industrial sector could also be motivated to use appropriately treated municipal waste water in processes which do not require good quality water. In India, for instance, industrial enterprises in the water-short city of Madras have expressed their willingness to buy treated waste water from the city authorities for reuse in their factories.

According to a 1989/90 ESCAP survey, only a few countries were at that time able to recover the costs of capital investment for their urban water supplies. Indeed, many were only able to recover the costs of operation and maintenance. Cost recovery was at lower levels for rural water supplies with only a very few countries reporting an ability to recover fully the costs of operation and maintenance. (See table 3.1). According to the survey, many countries

Table 3.1 Recovery of water supply costs

Country or area	Recovery of fixed costs (original investment)										Recovery of recurrent costs (operation and maintenance)												
	Urban water use				Industrial water use			Rural water use			Irrigation water use			Urban water use				Industrial water use		Rural water use		Irrigation water use	
	Commercial		Domestic		F	P	F	P	F	P	F	P	Commercial		Domestic		F	P	F	P	F	P	
	F	P	F	P									F	P	F	P							F
Afghanistan		x		x										x		x							
Australia	x		x		x			x				x	x		x					x		x	
Bangladesh	x		x		x					x		x			x							x	
China													x		x		x			x		x	
Guam													x		x		x					x	
Hong Kong		x		x				x					x		x		x			x			
India*		x		x				x					x		x		x			x		x	
Indonesia*		x		x				x					x		x		x						
Japan*	x		x		x			x				x	x		x		x			x		x	
Malaysia*		x		x				x					x		x		x			x		x	
Niue													x		x		x			x		x	
Philippines	x		x		x					x		x		x		x				x		x	
Republic of Korea	x		x		x					x		x		x		x				x		x	
Republic of Palau													x		x		x						
Samoa														x		x		x				x	
Singapore	x		x		x			x					x		x		x			x			
Sri Lanka		x		x									x		x		x					x	
Thailand*		x		x				x					x		x		x			x		x	
Vanuatu		x		x				x					x		x		x			x			

Source: ESCAP, *Review of Implementation of the programme of work and selected issues in the field of water resources: implementation of the Mar Del Plata Action Plan* (E/ESCAP/NR.15/18).

* Data from 1989. F = Fully. P = Partly.

only partly recover the operation and maintenance costs of water supplies for industrial uses. In some countries, such as in Thailand, the block rate system of charging used is more lenient to industry users at higher water use levels than to households.

The countries of Asia have only recently attempted to collect water fees for irrigation, the major consumer of water resources, and then mainly under water-short conditions. No country responding to the ESCAP survey recovered the investment costs of irrigation projects fully, although some countries indicated that they recovered part of the investment costs. Governments have relied on general taxation, indirect taxes, such as commodity export taxes, or loans from multilateral and bilateral sources to finance large public irrigation systems. In the long run, such systems will only be sustainable if the users of the water are paying the costs, at least of operation and maintenance. Expansion of irrigated areas will also depend on recovery of investment costs as much as availability of internal and external funding

In the region, traditional agricultural water policies have concentrated on supplying water for irrigation to meet national development goals, including the alleviation of poverty, self-sufficiency in food production, improvement of the quality of life in rural areas to reduce migration to the cities, and so on. There has not been much effort to promote the efficient use or reduction of wastage of irrigation water. There is a great need for education and training in the irrigation sector to improve efficiency in the management of the schemes and to reduce wastage of water. With the appropriate application of irrigation water and efficient management of the systems, not only can the quantity of water used be reduced, but also the salinization and waterlogging problems can be minimized. If properly implemented, pricing policies for irrigation systems could also reduce the wastage of water. Water saving as a result of a reduction in demand by the existing agricultural system could lead to the expansion of irrigation schemes without additional water production costs. Similarly, such surplus water can also be reallocated to urban areas and to industries to alleviate urgent problems there, at no additional cost.

In the region, there are great variations in water withdrawals among industries producing the same product. Therefore, there is scope for increasing the efficiency of water use by attaching regulations related to the amounts of water to be used per unit of production and disposal of effluents, and also by offering incentives.

Conflicts between farmers and irrigation authorities in some of the projects have led to less than optimal use of water and wasted financial investment during the past 20 years. In the large systems, farmers often feel that the project belongs to the Government, and that the Government is responsible for it in the event of breakdowns. Operation, maintenance and management have often been neglected by both sides. According to the Food and Agriculture Organization of the United Nations (FAO), the experience with small-scale locally managed irrigation projects in countries including China, Indonesia, the Philippines, Sri Lanka and Thailand, has been much more positive, especially where a Water Users Association or its equivalent has taken responsibility for the maintenance of a system. Where the farmers see a benefit from rational and dependable irrigation in terms of higher income, they make an effort to keep the system running properly and are willing to pay for its upkeep. The countries which are more successful seem to have greater decentralization in the management of water.

Urgent action is required to improve on-farm management in countries with a poor record of efficient usage. This would include: education and training of extension staff; a clearly defined division of responsibilities between farmers and irrigation authorities; strengthening of water and soil management research under irrigation and rainfed conditions; monitoring and evaluation of irrigation performance; and establishment of realistic water pricing policies to reduce wastage of water in agriculture.

Implementation of such measures will vastly increase the yields, reduce the water used, keep the systems functioning well, reduce problems, such as salinity and water logging, increase incomes and reduce investment requirements.

C. TELECOMMUNICATIONS

1. Efficient and effective utilisation of telecommunications equipment

It is reported that a paper⁷ prepared for the International Finance Corporation of the World Bank has stated that telecommunications infrastructure in developing countries is often underutilised because international assistance is generally directed towards core infrastructure such as exchanges and switches, and local

⁷ "Calling Out to Growth", *Far Eastern Economic Review*, (8 April 1993).

telecommunications authorities have to find their own funding for connections to consumers. Shortages in such funds result in connection delays and waiting lists, revenue loss and underutilisation of transmission capacity.

The paper also indicates that shortages in funds can inhibit the maintenance of existing telecommunications facilities to the extent that in developing countries 20-50 per cent of capacity in switches and transmission equipment is not working at any one time, resulting in poor completion rates for attempted calls.

In their 1992 joint report on "Telecommunication Indicators of the Former Soviet Union" the International Telecommunication Union (ITU) and the Organization for Economic Cooperation and Development (OECD) have made a number of comments pertinent to the management of telecommunications infrastructure not just in the new Central Asian republics but in any area of the region.

Particular reference is made to the need for service quality. The public network of the Central Asian republics is described as of "an inadequate and highly variable quality, making data communications and fax transmission difficult and rare". Local calls have failure rates of around 30 per cent, and interurban calls have even higher failure rates.

The report also comments on the knowledge and skills of managers in the telecommunications field. It is stated that local administrators have little experience in setting tariffs and need to learn and be able to apply basic accounting principles and procedures to tariff setting. In the context of tariff setting the report notes that there is no management information system for collecting relevant cost and call-pattern information.

Identifying a range of areas requiring managers' attention, such as the extent of cross-subsidization, the need for demand management evaluation and an examination of ways to reduce the cost of outward international calls to match those of incoming, the report emphasizes a critical requirement for high quality and effective management of this infrastructure.

D. RAILWAYS

Perhaps the most significant issue facing the region's railway managers is that of railway financial deficits. Indeed this is a world-wide problem and

not just restricted to developing countries. Not surprisingly therefore, the solutions proposed to counteract this problem in Asia are similar to those proposed (and being implemented) outside the region.

The factors which contribute to these deficits include: constraints imposed on the level of railway charges, either directly as part of government policy, or through competition from the road transport industry; requirements of Governments for railway organizations to continue providing certain uneconomic services; overmanning; low route productivity; and low locomotive productivity.

There have, however, been noticeable improvements in a number of indicators of railway performance in the recent past. Some mention is made below of progress made by a selection of the region's railway organizations in productivity enhancement, the management initiatives contributing to these improvements, the options available to these railway managements for further productivity improvements, and the factors constraining further progress.

1. Labour productivity improvement

In Asia, labour productivity improvements have been achieved mainly through the contraction of railway workforces. Most of the developing country railway systems of the region have reduced their workforces over the past six years (see figure 3.1). These workforce reductions, occurring during a period of moderate traffic growth, have resulted in significant improvements in employee productivity (measured in terms of GTK per employee).

Without exception, these reductions have been achieved by natural attrition (i.e., through the retirement, resignation or other voluntary separation and non-replacement of staff). By contrast, the very high rates of workforce contraction among the railway systems of developed countries have been achieved only by means of a managed retrenchment programme. In the case of New Zealand Rail, for example, a voluntary separation package was implemented to reduce the workforce by more than half in four years. As most railways are, however, not in a financial position to consider such options, government underpinning of such programmes may be necessary, especially if undertaken in a privatization/commercialization context.

Among the developing country railways, the strongest productivity growth was again recorded in

South-East Asia, with Indonesia and Thailand achieving an annual growth of 11.5 per cent and 9.2 per cent respectively. These results were not far short of those achieved by the systems of the developed countries (New Zealand Rail with 17.6 per cent a year⁸ and Westrail Australia with 9.3 per cent a year). By world standards, however, the labour productivity of the region's developing country railways is low (see figure 3.2), notwithstanding the impressive improvement of recent years. Only the Republic of Korea is achieving an annual labour productivity rate of more than 1 million GTK per employee, although the State Railway of Thailand is fast approaching this level.

The separation of the manufacturing and transport functions of railways is viewed in some quarters as a means of focusing management's attention on these fundamentally different activities, thereby improving the performance of both. It is understood that this has been recommended by the World Bank to Indian Railways, and that a recent loan was made conditional upon a 50 per cent reduction in the workforce of Indian Railways manufacturing

⁸ It should be noted that the sharp increase in the labour productivity of New Zealand Rail was achieved only as a result of a massive contraction of the workforce, which more than halved in four years. This workforce contraction was implemented in preparation for privatization.

workshops.⁹ A significant proportion of the workforce of the Chinese Railways (the total of which is some 3.3 million employees of all categories) is concentrated in non-operational activities, such as engineering workshop production. This railway system, with more than 60 employees per route kilometre, has very high manning levels by world standards. At a time when most of the railway systems reviewed were reducing their workforces at rates averaging between -1.3 and -19.0 per cent a year, the workforce of the Chinese Railways grew by an average of 1.1 per cent a year over six years.

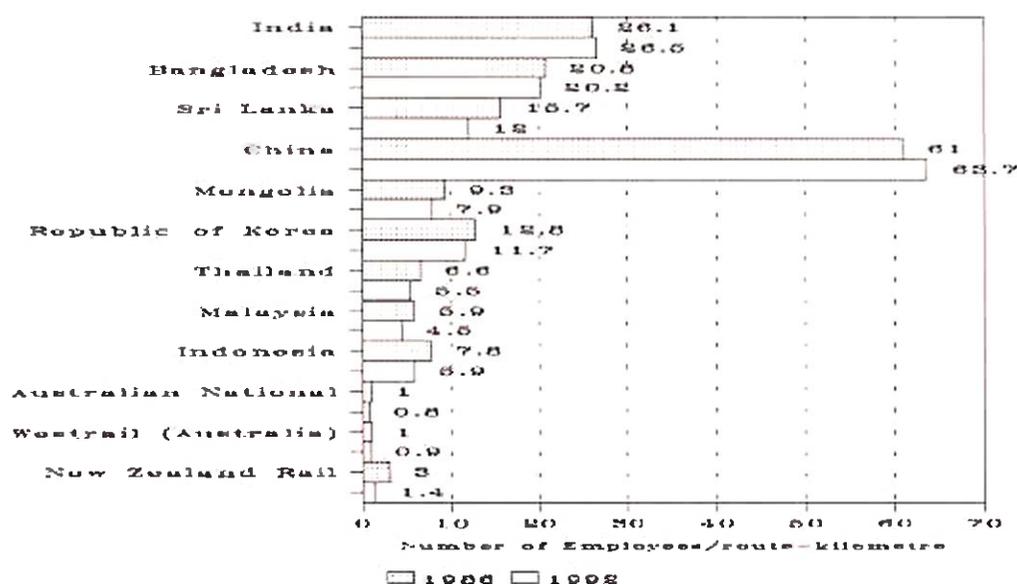
2. Route productivity improvement

The productivity of railway route infrastructure is determined by many factors, some of which have a primary impact on the productivity of other railway resources, such as labour, which are themselves critical to the achievement of route productivity goals. The more important of these factors are:

- (a) The provision of adequate track capacity (i.e., total length of running and yard track) to accommodate a growth in the frequency of train operations compatible with passenger

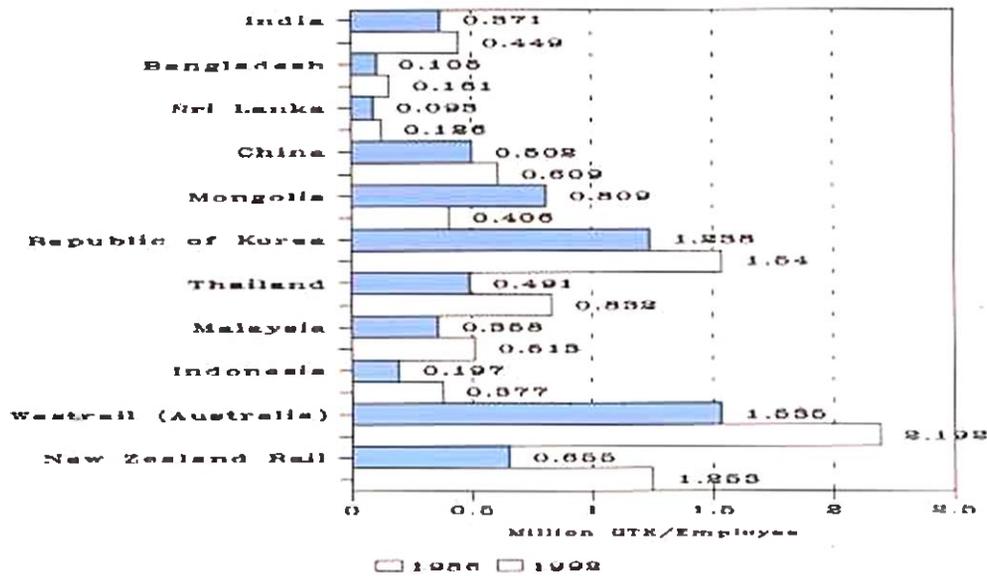
⁹ *Railway Gazette International*, (May 1993).

Figure 3.1 Employees per route-km selected railways, ESCAP region



Source: ESCAP questionnaires, 1990 & 1993

Note: Australia and New Zealand, 1988 data

Figure 3.2 Million GTK per employee of selected railways, ESCAP region


Source: ESCAP questionnaires, 1990 and 1993

Note: 1) China and India, 1991 data
2) Westrail and New Zealand Rail, 1988 data

- and freight tonnage growth;
- (b) The upgrading of track standards (for example, conversion to concrete sleepers and heavyweight rail) to allow increased axle loads, leading to the operation of higher powered locomotives, freight wagons of increased payload capacity, and longer and heavier trains. (Such an upgrading programme might also increase route capacity by allowing increased train running speeds);
 - (c) The upgrading of signalling and traffic control systems to permit reduced headways (time intervals between trains) and reduced block running times (i.e., time taken for transit of a signalling block section);
 - (d) Track electrification, to permit the operation of electric locomotives with heavy haul and higher operating speed capabilities. Electrification will also reduce operating costs, as suggested by the results of a recent study commissioned by the Indian Planning Commission, which shows that energy consumption by electric traction, as compared with diesel traction, in railway freight operations is in the ratio

of 1:3;¹⁰

- (e) Operational, scheduling and despatching improvements, such as increased night time scheduling of freight trains (with the aim of absorbing spare track capacity at times when passenger trains are not running);
- (f) Closure of poorly utilized branchlines and transfer of operating resources to lines of heavy traffic concentration.

Major route capacity improvements, such as the first four items in the above list require a substantial commitment of funds for capital investment. Such improvements are being undertaken by several railway systems of the region's developing countries, notably those of: China, where new heavy haul railway lines are under construction and where the capacities of existing lines are being expanded through the construction of additional running track and electrification; Indonesia, which is progressively upgrading its Sumatra coal carrying lines for higher axle load operations, and is converting its signalling systems in Java from

¹⁰ V. Jha, "Energy Planning & Management in Transport Sector" in *Indian Railways* (August 1991). The same study showed that railway electric traction was the most energy efficient of all transport modes, including barge transport, with energy consumption in relation to road freight operations (trucks) in the ratio of 1.0:18.76.

manual to semi-automatic block operation; and Thailand, which during the tenure of the 7th National Economic and Social Development Plan (1992-1996) plans to undertake track doubling on 145 kilometres of main line and trackwork expansion (to increase train crossing capacity) on another 244 kilometres of main line. Additionally, the Indian Railroad and the Korean National Railway (Republic of Korea) are undertaking track electrification projects, with the principal aims of increasing train operating speeds and reducing unit operating costs.

Operational improvements have been introduced by several systems during the past six years. Examples are to be found in the increased operation of block freight trains in Malaysia and Thailand, where a growing proportion of the total tonnage of railway transported petroleum and container traffic is being consolidated into block train loads. Block trains are generally longer and heavier, and operate less frequently than freight trains of mixed loading, with the consequence that they free up route and terminal capacity and permit traffic growth and increased route productivity.

However, the importance of proper maintenance of railway assets needs to be particularly stressed.

3. Locomotive productivity improvement

General operational improvements, such as the increased operation of block or unit trains in freight service and increased night-time scheduling of freight trains, will also have a beneficial impact on the utilization and productivity of a railway system's fleet of locomotives. Block trains generally operate in fixed formation, thereby eliminating the need for train marshalling (attaching/ detaching wagons to/ from trains) and releasing locomotives for other duties, or simply reducing the idle time of locomotives awaiting loading. Locomotive fleets are generally underutilized during night hours, when comparatively few passenger trains operate. Scheduling a majority of freight trains to run during the night could significantly reduce locomotive idle time and increase the productivity of the locomotive fleet. Necessarily, these measures have to be balanced against the needs of railway customers, but the improved locomotive productivity of a number of Asian railways which have also managed to reduce or contain the size of their locomotive fleets, would suggest that they have been able to reconcile operational requirements with market needs successfully.

Improved practices for the scheduled maintenance and overhaul of locomotives will increase the availability for traffic, and hence the utilization and productivity, of locomotive fleets. One system, for example, which has recently concentrated its efforts on improvement maintenance of its locomotive fleet is that of Bangladesh, where investment funds have been committed to substantial upgrading of workshop and overhaul facilities. Many of the region's railways have, however, neglected, for various reasons, the programmed maintenance of their locomotive fleets, and as the average age of these fleets increases they are now beginning to experience the consequences of this neglect in the form of higher service failure rates and reduced availability. To a lesser extent, the same observation may be made about the freight and passenger fleets of the region. However, the effects of neglected or deferred maintenance are more critical in the case of locomotive fleets which have a substantially higher capital value and hence contain a smaller maintenance reserve, i.e., the number of units which can be withdrawn for maintenance at any one time, without reducing availability.

There is scope to introduce other improvements in the management of the region's rolling-stock fleets. For example, the productivity of these fleets can be further improved if their deployment in service, or indeed the programming of their maintenance, is centrally controlled. Central control enables the optimum allocation of these resources to traffic generating locations, perhaps complemented by modern computer assisted fleet management systems.¹¹ However, some of the region's railways persist with the decentralized allocation and management of rolling-stock resources, whereby railway district administrations are allocated and given control over a fixed number of units. Such practices restrict the productivity of fleets on a system-wide basis.

4. Commercialization, corporatization and privatization

The question concerning the provision of services at rates which can never cover costs is also being addressed in a number of countries of the region. To assist this process, Indonesia and Thailand are developing traffic/service costing systems which will

¹¹ Indeed, some railways are in the process of either evaluating or introducing computerized wagon control systems (for example, the Indian Railways has commenced the introduction of its locally adapted system among its divisions).

ultimately enable them to determine the financial contribution of individual traffic segments and services.¹² These costing systems will later be the subject of community service obligation contracts with their Governments.

In an attempt to improve efficiency, the railways of Indonesia, Malaysia and Sri Lanka have recently been given management and financial autonomy through reorganization as corporations. The railway systems of Indonesia and Malaysia have not only been corporatized, but have also been set clear financial goals by their own Governments and have implemented a corporate planning process. The Korean National Railroad (Republic of Korea) is also planned to be converted to a "government invested enterprise" by 1 January, 1996.

The Sri Lankan Railways Bill which was introduced in April 1993, to convert the Sri Lankan Railway to corporate status, also provides for the restructured organization to enter into public service obligation contracts with the Government for the services it is required to operate without full recovery of costs.

The railways of Bangladesh, India and Myanmar have also recently been given commercialization directives by their governments, but are not as yet corporatized. The Government of India is progressively reducing the level of subsidy to the railway, and within the railway organization, profit responsibility is now devolved to divisional managers. In Bangladesh, public service obligation contracts have, from the 1992/93 financial year onwards, replaced a system of open-ended subsidies, and the Bangladesh Railway, with the assistance of the United Nations Development Programme (UNDP) and the Asian Development Bank (ADB), will shortly be reorganizing structurally, along business segment lines. In Myanmar, as from 1 April 1993, the railway organization established a commercial and marketing department, and introduced a train trip costing system, to assist railway managers in improving efficiency, reviewing tariff structures, and appraising future investments.

Within the region, only two railway organizations, those of Japan and New Zealand, have been privatized. The only other country of the region to have formally committed itself to a policy of privatizing its railway, Malaysia, has set 1997 as the date for full privatization.

5. Service quality

Another aspect of railway commercialization within the region is the introduction of the "total quality management" concept. The railways in the Association of South-East Asian Nations (ASEAN) have developed a collaborative approach to the introduction of total quality management, which involves the measurement, monitoring and control of service quality and standards, including those relating to service punctuality and reliability, as well as the cleanliness and effective maintenance of station facilities, traction and other rolling-stock.

E. ROADS AND HIGHWAYS

While there is significant activity occurring throughout the region in road and bridge construction, with major projects progressing in most countries, there has been little focus to date on the need to manage these expensive resources.

In common with other components of a country's infrastructure, roads and bridges deteriorate over time and in response to usage and weather conditions. Consequently, a carefully planned management programme is essential if investments are to be protected, returns maximized and costly rehabilitation or reinvestment avoided.

1. The need for maintenance

Road and bridge maintenance generally takes two forms: preventative maintenance and programmed maintenance. Preventative maintenance would, for example, include activities such as grading shoulders and cleaning drains to minimize the incidence of wash-aways. Programmed maintenance takes the form of planned rehabilitation.

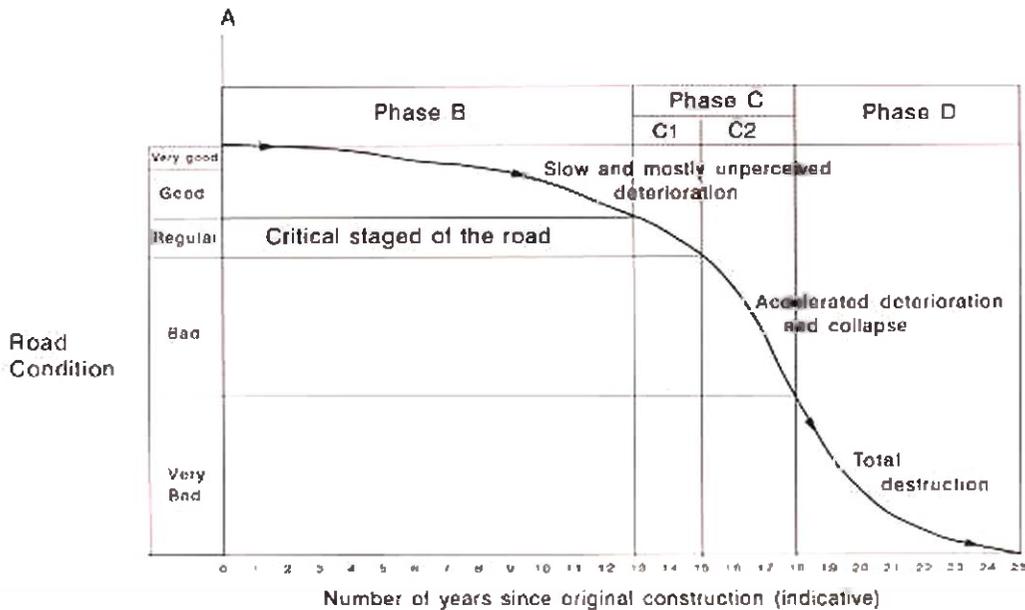
The United Nations Economic Commission for Latin America and the Caribbean has recently published the findings of a project financed by the German Agency for Technical Cooperation. The technical discussion in the report centres around a road deterioration curve which shows road conditions against time and identifies four phases in the life cycle of a road (see figure 3.3).¹³

Phase A corresponds to the day the road is opened. During Phase B the road is subject to a

¹² ASEAN Railways, *Status and Development Program, 1993*, ASEAN Railways General Managers' Conference, Bangkok, (April 1993).

¹³ Economic Commission for Latin America and the Caribbean, *Roads: a New Approach for Road Network Management and Conservation*, (LC/L. 693), Santiago, Chile (June 1993).

Figure 3.3 Deterioration of roads over time



Source: Economic Commission for Latin America and the Caribbean, *Roads: a New Approach for Road Network Management and Conservation*, (LC/L. 693), Santiago, Chile, June 1993.

Note: The shape of the curve shown here is based on asphalt concrete pavement. The deterioration curve for other types of roads is different from the curve shown. However, the 'general message' of the figure is equally valid for any type of road.

slow deterioration and weakening process, mainly in its pavement but also in the structure below the pavement. Phase C is the critical stage for the road when the deterioration process accelerates rapidly. It is during the early part of this phase that the surface of the road must be strengthened. For paved roads strengthening usually involves the application of a new layer, four to eight centimeters thick, of asphalt concrete to the existing pavement, at a cost of around 5 per cent of the original construction cost.

In the absence of strengthening towards the end of phase C large holes, wide cracks, depressions and deformations appear in the road. During phase D the asphalt breaks up and the road reverts to being initially a gravel road and then ultimately a dirt road. At the end of phase C and during phase D the only solution is the complete reconstruction of the road at a cost as high as 50 to 80 per cent of the cost of a new road.

Clearly sound road management practices would call for consistent monitoring of the conditions of roads and a programme of pavement strengthening at the early phase C stage. Indeed failure to undertake such action results in much higher costs at a later stage.

The question of road maintenance is also being looked at by the Sub-Saharan Africa Transport Programme, a joint undertaking of the Economic

Commission for Africa and several development agencies, coordinated by the World Bank. As part of this project it has been estimated that for every dollar spent on maintenance and rehabilitation, African countries can expect to save one dollar in reconstruction costs and another dollar in reduced wear and tear on road users' vehicles.

2. Regional maintenance practice

It is apparent from a range of sources that many countries in the region, for whatever reasons, do not have effective road management programmes in place.

A UNDP report of 1990 stated that the roads in Viet Nam were undermaintained, the annual budget for road maintenance being around \$25 million, equivalent to \$250 per kilometre, when \$1,000 per kilometre was seen as the desirable level. Lack of maintenance equipment was indicated as a major problem with a maintenance equipment fleet of 3,140 units of which only 1,507 were operational.¹⁴

More recently the Director of the Viet Nam Engineering Design Institute, which has studied the country's transport needs, has estimated that one third of Viet Nam's bridges need major repairs or replacement and that \$3 billion is required to

¹⁴ United Nations Development Programme, *Report on the Economy of Viet Nam* (December 1990).

prevent a further deterioration of roads, the rail network and inland waterways.¹⁵

An examination of public account statistics in the Philippines shows that there has been a significant decline in the funding of roads maintenance in the Philippines over the past decade. Indeed as figure 3.4 shows funding fell dramatically in 1982 and has never recovered to prior levels. Published statistics also reveal a preference for directing funding to new works rather than maintenance as shown in figure 3.5. While funding was located for a partial recovery of the programme of road investment, the funds have never been found to reactivate the maintenance effort. An earlier ESCAP study had noted in 1990 that maintenance funds for roads and bridges were less in favour in the Philippines than funds for new construction and that there was a preference for foreign bank loans to be used for construction rather than maintenance. The same study also remarked on the lack of sufficient heavy maintenance equipment such as road rollers, dump trucks, bulldozers, graders and service vehicles.¹⁶

Similarly a 1990 study of road transport in India found that a lack of budgeted funds for road maintenance was a major problem in India. It was estimated that rehabilitation of the road network at the time would have cost about \$15 billion which could have been reduced considerably by timely maintenance. It was estimated that actual maintenance expenditure was of the order of 30 to 50 per cent of the required level.¹⁷

The ECLAP paper referred to above itemizes typical problems which impinge on road maintenance (or conservation as it describes it) efforts. A number of these problems, all of which are listed below, are recognizable in the experiences of the countries examined above:

- (a) Lack of funds for road conservation;
- (b) Deficient execution of maintenance tasks;
- (c) Lack of maintenance planning;
- (d) Lack of maintenance equipment;

¹⁵ The Next Great Leap, *Far Eastern Economic Review* (22 April 1993).

¹⁶ ESCAP, "Road Bridge Maintenance" (ST/ESCAP/1157), page 156.

¹⁷ Gupta, D.P., Bhalla, M.K. and Chakraborty, S.S., "Strategy for Road Transport Development: Emerging Issues", *Indian Roads Congress Journal*, vol. 51-3 (New Delhi, November 1990), page 597.

- (e) Deficient maintenance of maintenance equipment;
- (f) Bureaucratic and administrative bottlenecks;
- (g) Low salaries and low motivation in maintenance agencies;
- (h) Low average qualifications of staff;
- (i) Surplus personnel;
- (j) Leakage of maintenance budget on staff related costs;
- (k) Lack of maintenance policy.

The report postulates that these problems have their origin in two fundamental causes:

- (a) An inadequate system for financing road conservation - it is impossible to base guaranteed, stable and long-term financing for road conservation on funds which need to be allocated from the general government budget, especially if the decisions on this allocation depend on the annual political budget debate;
- (b) An inadequate road management organization - it is extremely difficult for a government ministry to manage efficiently the road network of a country.

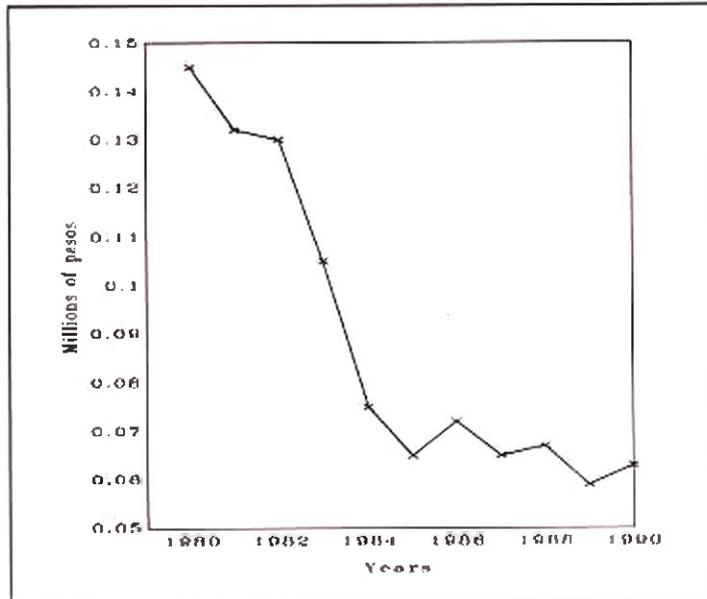
3. Policies for effective road management

The Sub-Saharan Africa Transport Programme has identified three basic issues which could be pursued by any country addressing its road management performance. These issues are: the need for national commitment; the development of accountability; and effective performance improvement and institutional reform.

In order to address these issues policy improvements have been considered in three critical areas: (a) planning, finance and budgeting; (b) operations; and (c) institutional reform and human resources development. Within each of these areas eight key policy issues have been identified:

- (a) Planning, finance and budgeting:
 - (i) Network based planning and programming;

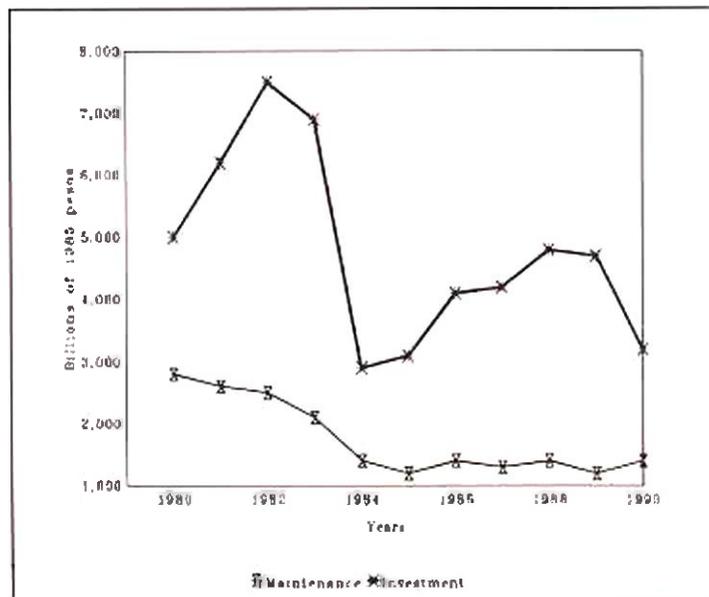
Figure 3.4 Expenditure on road maintenance, Philippines
(constant pesos per kilometre of paved public road)



Source: Department of Public Works and Highways, National Income Accounts, National Statistical Office.

Note: GDP deflator used for road maintenance expenditures.

Figure 3.5 Comparison of expenditures for road maintenance and investment, Philippines
(in billions of constant 1985 pesos)



Source: Department of Public Works and Highways, National Income Accounts, National Statistical Office.

Note: GDP deflator used for road maintenance expenditures; Investment deflator used for road investment (capital expenditure road construction).

Box III. LOCAL PARTICIPATION IN ROAD CONSTRUCTION DHADING DISTRICT, NEPAL

Traditionally, budget constraints and the lack of technical skills and institutional structures at the local level have militated against decentralization in the provision of infrastructure facilities. In recent years, however, many countries have been taking steps to increase local involvement.

The Dhading Development Project in Nepal is one example which involves local participation in road construction in the form of providing land, management and labour services.

Land required for the road is provided by the people free of cost (about 10 ropanies per kilometre at 10,000 rupees per ropani, which is equivalent to 100,000 rupees a kilometre).

District and village politicians, elected local officials, district government officials, elected parliament members etc. are represented in the road construction and management committee which makes policies, takes important decisions, mobilizes people, carries out overall supervision and manages the programme. Such persons provide voluntary services and are not paid out of the fund set aside for road construction.

Local people living along the road corridor under construction undertake the road construction work in the capacities as beneficiary workers, such as common labourers, *naikes* (gang leaders), masons and supervisors. These people are paid minimum wages established by the policy-making road committee. Contracts are avoided for work execution. This approach saves funds which otherwise would have gone to the contractors, their clients and mentors. A contractor officially is allowed a legal profit margin ranging from 10 to 20 per cent of the estimates which is saved. Most contractors make much more profit than this, by adopting every possible means and techniques. In the participatory approach, the funds budgeted for the road programme do not reach the middle persons and groups. As a result, the local road programme becomes extremely cost-effective by 4 to 6 times, compared with similar line agency programmes.

A central government managed line agency programme requires about 20 per cent of the estimated cost of the programme to meet the overhead costs of supervision and management. The Dhading local road programme requires only a very low percentage of the budget to meet the overhead costs because of the participatory approach followed.

The management of the local road programme is done voluntarily by the road committee formed for each road site. The technicians, the sub-overseers, overseers, accountants and engineers are provided by the district development secretariat office. The technicians provide necessary technical know-how and fulfil all official formalities of measurement and certification of the works, quality control and muster roll approval for the payment of wages to the beneficiary workers of the programme. Approval for payment of wages is made by the LDO/PC and accountants of the LDO/PC office travel to the road site and make wage payments to the workers roughly once a month. Only the travelling costs and daily allowances of the technicians and the accountants are paid out of the road budget. Road site stores are rented for the storage of construction materials and tools; rents are paid out of the road construction budget.

A central government managed line agency programme would require a big project staff, offices, living quarters, stores, cars, trucks etc. in advance before the project started. In the local road programme of Dhading, such project infrastructure and logistics became unnecessary. Even the working tools were given to the individual workers to take home daily under the guarantee of the *naike*. The local people themselves provided the infrastructure and logistics necessary for the programme. That also contributed to the cost-effectiveness of the road programme.

The people of the Dhading local road programme worked longer hours. The working hours on project sites managed wholly by government agencies is 5 to 6 hours. However, the working hours in the Dhading local road programme was 7 to 8 hours. The people participating in the construction of the local roads programme were found willing to work extra hours as part of their local contribution. This also contributed to the cost-effectiveness of the local road programme.

The daily wage rates of the road workers was fixed by the district level policy-making road committee. The committee members contacted the road workers, obtained their ideas and took them into confidence before fixing the wages once every one or two years, or as necessary. The daily wages fixed in 1990/91 were about 20 per cent less than the daily wage rates fixed by the district wage fixing committee. The percentage less amounts are considered an indirect local contribution to the road programme.

Source: Deutsche Gesellschaft fuer Technische Zusammenarbeit (GTZ) GmbH, German Technical Cooperation, *Programme Component Status Report, Infrastructure*, 1991.

Note: One *ropam* is about $\frac{1}{20}$ of a hectare.

- (ii) Improved collection and disbursement of funds;
- (iii) Introduction of performance budgeting;
- (b) Operations:
 - (i) Reducing force account and increasing use of local contractors;
 - (ii) Increasing use of labour-based methods;
 - (iii) Reduction of publicly owned equipment fleets;
- (c) Institutional reform and human resources development:
 - (i) Institutional reform;
 - (ii) Improved staff motivation and utilization.

F. URBAN TRANSPORT MANAGEMENT

Restrictions on the movement of people and goods owing to chronic road traffic congestion in several major cities of the region have been well documented and are widely known. Not so widely appreciated are the differences amongst these cities in terms of the scale of the problem, the main contributory factors, the remedial measures which have been attempted, and the relative successes or failures experienced in these attempts.

While cities often face traffic mobility problems of a similar order of severity, they differ markedly in the approach taken to integrated planning and control

of land use, trip demand management, traffic management, and the provision and promotion of public as opposed to private transport. Some cities of the region provide positive examples of the extent to which selective and well targeted planning and control measures can be successful in optimizing the flow of traffic and in minimizing the investment required in road and public transport infrastructure.

This section describes the urban transport management problem in two contrasting sets of cities: Bangkok and Manila, on the one hand, with acknowledged difficulties, and Hong Kong and Singapore, with acknowledged successes.

1. The scale of the problem

A difficulty posed for any comparative assessment of the scale of the traffic congestion problem across cities is one of differing standards. What might be considered a congestion problem in one city may not be considered so in another. On the Tokyo expressway system, congestion is considered to have occurred when the average speed (including the time spent both stationary and moving) falls below 10 kilometres per hour.¹⁸ This figure appears to be a reasonable measure of road traffic congestion in cities where motorized vehicles dominate peak period traffic flows, but in cities, such as those of China, where bicycles or other non-motorized forms of transport are heavily used, a lower congestion threshold speed might be more appropriate.

¹⁸ World Bank, *Urban Transport in Asia: An Operational Strategy for the 1990's*, draft report (June 1991).

Table 3.2 contains estimates of average travel speeds in peak period traffic in the four cities reviewed. These speeds are shown against factors thought to contribute most to road traffic congestion, such as vehicle density (i.e., the vehicle population related to the length of the urban road system), growth in the vehicle population, private car ownership ratios and growth trends, and the proportion of urban trips by private car or taxi. In addition, other factors likely to have an influence on stemming the congestion of urban roads, such as the application of land use planning controls tied to the capacity of transport infrastructure, the imposition of road congestion charges, and the presence of a mass transit system, are included in the table.

The table shows very clearly the differences between the cities reviewed in terms of the scale of the road traffic congestion problem and the factors contributing to the problem. The situation in each of these cities is described below.

Bangkok

Bangkok is generally acknowledged to have the worst traffic congestion of any city in the region, and arguably has a position near the top of the list of the worst congested cities of the world. It is in this unenviable position because peak period delays in Bangkok are more widespread and of longer duration than other cities of comparable population density.

On average, each car is estimated to spend the equivalent of 44 days a year in traffic jams.¹⁹ (For most Bangkok commuters, this is the result of spending something in excess of two hours on the roads in both the morning and evening peaks, every working day). The productivity loss resulting from time spent commuting in Bangkok was recently costed by the World Bank at as much as 1.7 per cent of the gross domestic product of Thailand. The cost of fuel wastage caused by traffic jams in Bangkok has been estimated at \$1.5 billion per year.²⁰ While the average speed of travel during peak periods in Bangkok is estimated at only 8 kilometres per hour, the city has numerous bottlenecks through which the peak traffic flow is reduced to less than 1.5 kilometres per hour.

¹⁹ World Bank, Asia Technical Department, Infrastructure Division, *Urban Transport in Asia - an Operational Strategy for the 1990's*, draft report (June 1991).

²⁰ ESCAP, *State of Urbanization in Asia and the Pacific, 1993* (ST/ESCAP/1300).

The characteristics of the urban environment in Bangkok which have contributed most to the city's chronic road congestion problems are those related to the inadequacy of the road infrastructure, the massive and fast growing motor vehicle population, the high ratio of private car ownership, and an underdeveloped public transport system. While the area under the control of the Bangkok Metropolitan Administration (covering the inner city and much of Greater Bangkok) contains only 2,800 kilometres of roads, accounting for only 8 per cent of the land area within the BMA boundaries, more than 2 million motor vehicles are registered in this area and in the urban areas of five adjacent provinces. On the assumption that all of these vehicles can potentially use BMA area roads, the vehicle density for Bangkok is more than 700 vehicles per kilometre of road, which is more than double that of Hong Kong – a city of considerably greater population density than Bangkok, and nearly four times that of Singapore.

The motor vehicle population of Bangkok is growing at a faster rate (10.4 per cent a year) than that of any of the other three cities reviewed. Furthermore, Bangkok has a rate of private car ownership, which at one car for every 10 persons is only equalled by Singapore. This high rate of private vehicle ownership, coupled with a limited public transport service, explains the high rate of private car or taxi commuting in Bangkok, which at 35 per cent of all trips, is one of the highest among the cities of Asia.

Manila

Traffic conditions in Manila are only slightly better than those in Bangkok. Manila has a lower vehicle density and a substantially lower rate of private vehicle ownership than Bangkok. However, its total motor vehicle population is growing nearly as fast as that of Bangkok, and the low rate of private vehicle or taxi commuting in Manila masks the fact that vehicles of low passenger carrying capacity (including jeepneys) account for more than three quarters of all trips by motorized vehicle in Manila.

It was recently estimated that the elevated light rail system and the suburban rail services of the Philippine National Railway account for less than 2 per cent of all trips in Manila, suggesting that mass transit services are providing little relief in terms of reducing road congestion.²¹

²¹ 'Bangkok Nightmare Threatens Manila' in *Bangkok Post* (25 October 1993).

Table 3.2 Measures of road traffic congestion and contributory factors, selected cities

City	Resident Population (1990)	Length of urban road network (kms)	Motor vehicle population ^a			Private car ownership		Percentage of trips by private car or taxi	Estimated average travel speed during peak times (kms/hour)	Mass transit system	Land use planning applied	Road congestion pricing
			Total	Growth rate % p.a.	No./km of road	No. of cars	Persons per vehicle					
Bangkok	6162000 ^b	2800	2046000	10.4	731	611700	10	35	8	No	No	No
Manila	8475000	2938	800000	10.0	272	300000 ^c	28	18 ^d	10	Yes, limited	No	No
Hong Kong	5851000	1559	471200	6.6	302	265800	22	20	22	Yes	Yes	No
Singapore	2762700	2924	559300	3.2	191	285300	10	n.a.	30	Yes	Yes	Yes

- Sources:
1. ESCAP, *State of Urbanization in Asia and the Pacific* (ST/ESCAP/1300), 1993.
 2. World Bank, Asia Technical Department, Infrastructure Division, Draft Report, *Urban Transport in Asia, An Operational Strategy for the 1990s*, June, 1991.
 3. Asian Productivity Organization, *Keep a City Moving – Urban Transport Management in Hong Kong*, 1993.
 4. Government of Singapore, *Singapore Facts and Pictures*, 1992.
 5. United Nations Department of International Economic and Social Affairs, *Population Growth and Policies in Mega-Cities, Metro Manila*, Population Policy Paper No. 5, (New York, 1986).
 6. ESCAP, *Review of Developments in Transport and Communications in the ESCAP Region 1993* (ST/ESCAP/1333) – response to road questionnaire.
 7. "Breaking Up the Jams", *Asiaweek*, 28 February, 1992.
- Congestion threshold speed, as defined by Tokyo traffic management authorities for expressway system.
- ^a Vehicle population for most recent available year, 1990-1992.
- ^b Population within Bangkok Metropolitan Administration boundaries.
- ^c Secretariat estimate.
- ^d In Metro Manila, paratransit (jeepney) services account for 59 per cent of all motorized trips.

The average speeds for peak period travel in Manila are now estimated to be at the congestion threshold of 10 kilometres per hour. Traffic conditions on the twelve lane, 20 kilometre EDSA expressway, linking Metro Manila's four cities, typify the current peak period traffic experience in Manila. During these periods, the bulk of the estimated daily flow of one million persons and 154,000 vehicles, passes along this route, resulting in average speeds of less than 10 kilometres per hour.

Hong Kong

Hong Kong has the advantage of having three modern mass transit systems, a high capacity metro or mass transit railway, a suburban electric commuter railway, and a new light rail (LRT) system in the New Territories. Collectively, these account for about 30 per cent of the 9 million daily trips estimated to be taken by all forms of motorized transport in Hong Kong. In addition, extensive bus services provide about 46 per cent of these trips.

Private car ownership is at a low level compared with Singapore and Bangkok, at around one vehicle for every 22 persons. The growth in the number of private cars was restrained for about five years following sharp increases in ownership taxes in 1982, but has recently resumed a higher growth path.

Despite the fact that public transport accounts for about 80 per cent of all trips, congestion is frequently encountered on all major arterial roads in Hong Kong. The White Paper on Transport Policy in Hong Kong (1990) predicts that, notwithstanding a 27 per cent increase in road capacity by the mid-1990's from currently committed road projects, average peak hour speeds on Hong Kong Island can be expected to fall from 22 kms per hour currently, to 15-17 kms per hour by 2001.²²

Singapore

Singapore has by far the most fluid traffic conditions of any city in Asia. Singapore government statistics show that average peak hour speeds in Singapore scarcely varied between 1984 and 1988, remaining around 30 kilometres per hour, despite a continuing growth in the vehicle population, but negligible growth in road space.²³

In recent years, the growth of the vehicle population has been substantially lower than that of the other three cities reviewed in this paper. For example, during the past five years, it was only about one third of the growth recorded for Bangkok. The success of policies aimed at motorization restraint is clearly reflected in the statistics.

Moreover, policies directed at restricting vehicle access to the Central Business District and encouraging the use of high quality public transport appear to have had a major impact on the moderation of traffic congestion. Significantly, the number of passengers carried on the Singapore Mass Rapid Transit system almost doubled from 122.1 million in 1989 (the year after its opening) to 221 million in 1992.²⁴ Initiatives currently being taken to integrate the MRT and public bus infrastructure, services, fares and dissemination of information, are likely to sustain the rapid growth in the patronage of public transport.

2. Congestion counter measures

Policy and management measures which may be applied to counteract the problem of urban road traffic congestion are of three main types, and within each, individual measures can have either a short-term or a long-term implementation time frame. The main practical measures are listed in table 3.3. This table does not present an exhaustive list.

In recent years, significant advances have been achieved in the theory and application of urban transport management techniques. In more than a few cases, these advances have been made in cities of the developing world. One frequently quoted example of a city which has achieved marked success in avoiding traffic congestion through the application of systematic urban planning techniques is that of Curitiba, in southern Brazil.

Curitiba has a resident population of 1.6 million, but a private vehicle population of 500,000. Despite having more cars per head of population than any other Brazilian city (and probably more private vehicles per capita than any other city in the developing world), Curitiba does not have a traffic problem.

²² Asian Productivity Organization: *Keep A City Moving - Urban Transport Management in Hong Kong* (Tokyo, 1993).

²³ *Op. cit.* World Bank, 1991.

²⁴ ESCAP, *Review of Developments in Transport and Communications in the ESCAP Region 1993* (ST/ESCAP/1333) - response to Urban Public Transport questionnaire.

Table 3.3 Urban transport management measures

<i>Type of measure</i>	<i>Implementation horizon</i>	<i>Nature of measure</i>	<i>Description of measure</i>	<i>Objectives</i>
DEMAND RESTRAINT	LONG TERM	LAND USE PLANNING	<ol style="list-style-type: none"> 1. Plan and control type of land use permitted in urban corridors 2. Plan and control building densities (ratio of floor area to land area) in urban corridors 	<ol style="list-style-type: none"> 1. Achieve cluster development of housing, employment and services (including transport) in order to minimize need for travel 2. Ensure that trip generation of buildings conforms with capacity of surrounding roads and public transport infrastructure
	SHORT TERM	ROAD CONGESTION PRICING	<ol style="list-style-type: none"> 1. Levy charges on all but emergency and public transport vehicles entering congested zones 2. Levy differential parking charges in congested and non-congested zones 	<ol style="list-style-type: none"> 1. Restrict non-essential vehicle trips within currently congested zones 2. Restrain non-essential vehicle usage of congested zones
TRAFFIC MANAGEMENT	LONG TERM	FULL COMPUTERIZATION OF TRAFFIC SIGNALS	<ol style="list-style-type: none"> 1. Computer coordination of signals, giving "green" priority to predominant traffic 2. Give public transport vehicles automatic priority at signalled intersections 	<ol style="list-style-type: none"> 1. Maximize traffic flow 2. Maximize flow and trip capability of public transport vehicles, leading to reduced fleet and investment; attract private car users to public transport
	SHORT TERM	VEHICLE/TRAFFIC TYPE SEGREGATION	Physically separate pedestrian/bicycle/car/ public transport vehicle flows, by providing and strictly enforcing access to, dedicated traffic lanes	<ol style="list-style-type: none"> 1. Maximize flows of high capacity, at the expense of low capacity, modes 2. Attract private car users to public transport
		STRICT ENFORCEMENT OF TRAFFIC BY-LAWS	<ol style="list-style-type: none"> 1. Penalize motorists for parking in no parking zones 2. Penalize other traffic infringements, such as executing U-Turns from lanes adjacent to the turning lane 	<ol style="list-style-type: none"> 1. Remove impediments to the traffic flow on heavily congested roads 2. As per (1.) above
PUBLIC TRANSPORT IMPROVEMENT	LONG TERM	INVESTMENT IN HIGH CAPACITY MASS TRANSIT SYSTEMS	Invest in LRT or mass transit (metro) systems.	<ol style="list-style-type: none"> 1. Maximize commuter flows per unit of capital and operating cost 2. Attract private vehicle users; reduce road congestion
	SHORT TERM	OPERATIONAL AND PRICING IMPROVEMENTS	<ol style="list-style-type: none"> 1. Improve service standard of existing UPT (safety, cleanliness, staff/passenger relations) 2. Reform fare structure (ticketing integration with other services, modes, bulk ticket incentives) 	Attract private vehicle users; reduce road congestion

This is because it has been able to integrate successfully land use and urban transport planning, in such a way that land development has been guided along linear axes from the city centre, each axis being served by dedicated bus lanes. The land use plan of Curitiba, like those of most cities which have systematic urban plans, emphasizes control of both the kind and density of land use. In Curitiba, higher building density ratios (i.e., ratios of floor area to land area) are permitted along the designated public transport axes than in areas remote from these axes. The effect of these controls has been to encourage matched development of commercial and high density residential buildings outside the central city area, with consequent restraint on the generation of trips between the outer and inner urban areas.²⁵

Another important aspect of the urban development of Curitiba is that it has been designed around a city-wide bus transport system. Buses operate in an hierarchical system of interconnected services, from express to inter-district and feeder services. Express buses operate in dedicated bus lanes on five arterial or "structural" routes. At intersections, traffic signals are activated by the buses themselves, to give them priority in the traffic flow. Other features, such as automatic fare collection,

²⁵ J. Rabinovitch, *Urban Public Transport Management in Curitiba, Brazil* In United Nations Environment Programme *Industry and Environment* (January - June, 1993)

controlled boarding for the express bus system (through specialized "boarding tubes"), and extensive use of articulated buses, are intended to minimize delays, maximize flows, and minimize capital and operating costs.

A compelling factor in the city's choice of a bus system, rather than a metro or light rail system, was its attractive cost relative to the capacity it provides. Table 3.4 provides a comparison of the typical capital costs, passenger capacities, and unit operating and capital costs of the principal urban transport modes.

There would seem to be considerable merit in city managements that have traffic congestion problems adopting a system of either segregated busways or strictly enforced bus-only lanes, complemented by prioritized control of traffic signals. It should be recognized that while these systems may provide a satisfactory and comparatively easily implemented solution in the short term, they are unlikely to provide sufficient capacity for those densely populated cities of the region now facing extreme traffic congestion. In the long-term, the construction of high capacity mass transit systems may be the only practical solution for these cities. The capital costs of the highest capacity mass transit systems, however, may prove beyond the financing capability of many city, provincial or even national Governments of this region.

Table 3.4 Comparative costs and capacities of urban public transport systems

System type	Capital cost per kilometre, excluding cost of vehicles (millions of dollars)	"Lane capacity" ^a		Cost per passenger - km (dollars) ^b	
		(Passengers per hour)	Index		Index
Private cars	n.a.	5,000 - 10,000	100.0	0.12 - 0.24	100.0
Buses in mixed traffic	n.a.	10,000-15,000	200.0 - 300.0	0.02 - 0.05	16.7 - 20.8
Bus only lanes	n.a.	15,000 - 20,000	300.0 - 400.0	0.02 - 0.05	16.7 - 20.8
Segregated busways	2 - 7	30,000	600.0	0.05 - 0.08	33.3 - 41.7
Light Railway (LRT) - Surface	6 - 10	20,000 - 36,000	400.0 - 720.0	0.10 - 0.15	62.5 - 83.3
Elevated metro	45 - 55	70,000	1400.0	0.12 - 0.20	83.3 - 100.0
Underground metro	85 - 105	70,000	1400.0	0.15 - 0.25	104.2 - 125.0

Source: United Nations Department of International Economic and Social Affairs, *Urban Transport Development with Particular Reference to Developing Countries*. New York, 1989

^a The maximum number of passengers which can be carried on a single lane or track past a point during one hour.

^b Capital and operating costs related to infrastructure, where applicable, and vehicles, including interest charges.

Box IV. INTEGRATED URBAN PLANNING IN HONG KONG

The problems being faced in the cities in the ESCAP region clearly show the need for integrated land use and transport planning. In this context the principal aims of Hong Kong's Metroplan illustrate some of the strategic considerations which need to be taken into account when developing such plans. Metroplan's principal aims include:

- (a) To enhance Hong Kong's role as an international business, finance and tourist centre; as a centre for a diverse range of light manufacturing industry and as the centre of Government for the territory;
- (b) To provide opportunities to satisfy, as far as practicable, housing needs according to what people can afford and where they would like to live;
- (c) To achieve a more balance distribution of jobs relative to population concentrations, the locational preferences of new enterprises and the ease of travel;
- (d) To sort out land-use patterns to create a more acceptable urban environment: This may involve:
 - (i) Relocating activities which create severe environmental problems;
 - (ii) Reducing population densities by such means as spreading development on to adjoining harbour reclamations and comprehensive urban renewal;
 - (iii) Providing conveniently located community facilities which aim at new town standards;
 - (iv) Creating an urban form that will foster a sense of community identity;
 - (v) Conserving and enhancing major landscape attributes and important heritage features;
 - (vi) Providing a multichoice, high capacity transport system that is financially and economically viable, energy efficient and makes provision for the safe and convenient movement of pedestrians;
 - (vii) Producing a strategy that can be carried out by both the public and private sectors under variable circumstances, particularly with respect to the availability of resources and significant changes of demand.

Source: *Metroplan, the Selected Strategy and Overview*, Hong Kong Department for Planning, Environment and Lands.

3. Regional experience in the application of urban transport management measures

The four cities reviewed in this paper have had varying success in the application of measures outlined in the foregoing section. The experience of these cities in applying measures of different types is described below.

Land use planning and control

In Bangkok, the city plan incorporates the zoning of allowable forms of land use, but inconsistencies in enforcement have sometimes led to a mix of building types and forms of land use, as well as inadequate provision for public utilities, including transport. An example of the latter was recently provided in the planning for construction of a light

railway, when the private developer of this project was forced to seek permission for the allocation of a site for a terminal and maintenance depot within a portion of a city park. Similarly, although building density regulations are applied in Bangkok, it is possible that the plot ratios (ratio of building floor area to land plot area) for many parts of the city have not been specified with the capacities of surrounding roads, nor of the available public transport (bus) services in mind. Thus, new high rise, high density residential building projects are sited along arterial roads, on which there is a heavy concentration of traffic for most of the day, and in areas which are relatively remote from workplaces.

In Manila, a Comprehensive Zoning Ordinance for the National Capital Region was signed into law in 1981, but the enforcement of this ordinance has been frustrated by the budgetary restrictions faced by the enforcement authority. Land speculation,

coupled with lack of access of some large remaining parcels of land in the central area to basic infrastructure and services, has forced residential developments, without complementary commercial developments, to the outskirts of the city.²⁶

Hong Kong has a city plan, "Metroplan", which incorporates a systematic approach to transport planning linked to a strategic land use plan. This plan continues the centralizing emphasis of previous plans, by promoting expansion of the central business district through land reclamation, land use intensification, land use succession, as well as urban redevelopment and renewal.²⁷ While the application of this planning approach has played a major role in making Hong Kong a dynamic financial and commercial centre, there are dangers in the prevailing planning strategy, which polarizes commercial and residential development. By focusing public housing development in the New Territories, without the development of commercial and industrial activities adjacent to the housing estates, the urban planning processes are increasing the dependence of the population of Hong Kong on road and urban public transport infrastructure. To date, the planning processes have worked well in the sense that they have correctly identified the transport need, and development of roads and urban public transport infrastructure has followed suit. However, it remains to be seen whether a decentralizing, rather than a centralizing, strategy might not have produced a better result in terms of the use of the community's resources.

In Singapore, land use planning has been developed into a fine art. The integrated development of industrial, commercial and housing facilities in Jurong, at the western end of Singapore Island, some 20 kilometres from the Central Business District is an example of a land use planning initiative which appears to have succeeded in reducing commuter traffic to and from the city centre. In addition, land use control processes in Singapore include the strict enforcement of building density ratios which are in harmony with the capacity of the surrounding transport and public services infrastructure.

²⁶ United Nations Department of International Economic and Social Affairs, *Population Growth and Policies in Mega-Cities - Metro Manila* (New York, 1986).

²⁷ L.H. Wang, *Overview of the Transport System and Transport Management in Hong Kong*, in *Keep a City Moving - Urban Transport Management in Hong Kong*, Asian Productivity Organization (Tokyo, 1993).

Road congestion pricing

Singapore is the only city in the region which has adopted a system of trip restraint through road congestion pricing measures. Known as the Area Licensing System, this system was implemented in June 1975, with the objective of reducing congestion in the city centre during the morning peak period.

The scheme does not operate on Sundays and public holidays. Two types of licences are issued: a daily licence, for which fees of S\$1.00, S\$6.00, and S\$3.00 apply respectively to motorcycles, company cars and all other chargeable types of vehicle; and a monthly licence, for which fees are twenty times the daily fee. The Area Licensing Scheme is supported by strict controls on the volume of car parking spaces which business and public agencies may provide within the restricted zone.

A survey conducted in 1989 demonstrated that the Area Licensing Scheme had succeeded in reducing by 31 per cent the number of vehicles entering the restricted zone during the morning peak period in the survey period, as compared with the average number entering this zone in 1975, before the introduction of the scheme. The effectiveness of the scheme is also reinforced by the fact that, during the 14-year interval between the introduction of the scheme and the survey, the restricted zone had grown by one third in terms of employment and the vehicle population had grown by two thirds.²⁸

A pilot test of an electronic road pricing scheme was conducted in Hong Kong over a 21-month period between 1983 and 1985. The test indicated that the scheme was technologically sound and practical, but the scheme was not implemented on a permanent basis owing to public concern that it would involve an invasion of privacy. This concern arose mainly from a perception that the scheme could be used to monitor the trips of motorists. Accordingly, the White Paper on Transport Policy in Hong Kong includes a recommendation to retain area pricing, without trip recording features, as a long-term policy option.²⁹

²⁸ World Bank, *op. cit.* page 31.

²⁹ Government of Hong Kong, *Moving into the 21 st Century*, the White Paper on Transport Policy in Hong Kong (January 1990).

Other demand restraint measures

In Singapore, a radical new scheme was introduced as from 1 May, 1990, with the aim of restraining the growth of the vehicle population through the auctioning of rights (known as Certificates of Entitlement) to register motor vehicles. This process typically adds S\$10,000 - 12,000 to the cost of registering a new vehicle for ten years. This measure is reinforced by an appropriate scale of taxes and charges payable for the registration of cars. For example, the annual road tax payable on a 1600 cc car alone amounts to S\$1,700. When added to the market value of the vehicle, import duty, registration and additional registration fees, as well as the cost of a Certificate of Entitlement, the total cost of putting that 1600 cc vehicle on the road could be as much as S\$62,000.

The success of this type of measure in restraining car ownership, whilst guaranteed in the case of a city state such as Singapore where the charges may be narrowly focused on local road users, may not be as easily applicable in Thailand or the Philippines, where all vehicle owners, whether or not they were users of city roads, would be penalized. In such situations, the Government would need to address the issue of equity in charging and cross-subsidizing one group of vehicle owners by another. Recent proposals to regulate vehicle ownership in Bangkok through increases in import duties or fuel taxes would also need to address this difficulty.

Another measure which has had some success in restraining vehicle usage of inner city congested roads in the region is the restriction on provision of inner city car parking facilities (in combination with stringent enforcement of on-street parking by-laws). In Hong Kong, for example, the overall parking space to vehicle ratio is less than 1 to 3, and even lower in the inner city area.

The success of all demand constraint initiatives will be dependent on the availability of viable alternative means of transport. If, for example, there is no adequate public transport system, motorists have no option but to use their cars.

Traffic management

Computerized Area Traffic Control (ATC) is widely employed in both Hong Kong and Singapore. The system permits effective coordination of linked traffic signals on an area-wide basis. One of its important features is that it can give priority of passage through junctions to the direction of

predominant traffic volume. It can regulate the green cycle at a series of closely spaced intersections on the basis of measured vehicle volume. In neither city, however, is the ATC system capable of providing priority to public transport, although bus-only lanes are a common feature of traffic management in both cities.

In Bangkok and Manila, where the inadequacy of road space is the overriding problem, ATC systems are unlikely to provide any substantial relief from traffic congestion, except perhaps during periods of lighter traffic. In Manila, more than \$600 million has been expended on the installation of a computerized traffic signalling system during the past ten years, but the system has often been rendered inoperative by electric power outages and manual overriding.

All four cities employ bus-only lanes during peak traffic periods, but in no case are the bus lanes physically separated (by barriers etc.) from the residual traffic. "Busways" of the latter type are rare in Asia. The "bus-only lane" system needs to be strictly enforced to be successful. In Hong Kong, the enforcement of a bus-only lane on a 1.4 kilometre section of Pokfulam Road (on Hong Kong Island) during the morning peak has resulted in a reduction by more than half in the bus trip times on this section.³⁰

In Hong Kong, also, significant improvements have been made in the segregation of vehicular and pedestrian traffic. Pedestrian footbridges and subways have been constructed throughout Hong Kong, to avoid the safety problems and disruption to traffic from pedestrians crossing roads at-grade. Further, in the Central Business District of Hong Kong a major elevated walkway network has been constructed, providing interconnection between major buildings entirely on grade separated structures.

In Bangkok, the governing city body, the BMA, has a programme to construct pedestrian overpasses along major roads. While considerable progress has been made during the past five years, there will always be scope for increased separation of vehicular and pedestrian traffic while the current level of congestion prevails.

Investment in high capacity mass transit systems

While modern mass transit systems, providing an extensive coverage of the commuter catchment

³⁰ *Keep a City Moving*, op. cit. page 66.

area, have been developed in Hong Kong and Singapore, progress on the development of such systems in Bangkok and Manila, has been slow.

Of three Bangkok mass transit projects approved in 1990 for development by the private sector under build-operate-transfer contracts, only one has so far commenced, and it is still in the very early stages of construction. The desirability of constructing one of these projects, a 20-kilometre elevated mass transit railway, which had earlier been delayed by contractual difficulties, has recently been questioned in the light of competitive proposals for the construction of a subway system. During October 1993, the Government of Thailand announced that an urban transit master plan would be developed within six months which would ensure effective coordination, and reduction of physical and operational conflicts between the various projects. In Manila, a start on construction of the next stage of the Manila LRT was recently announced.

While the necessity of constructing mass transit systems in cities of the population size and density of Bangkok and Manila cannot be denied, there is still obviously a need to take further short-term corrective measures. The smallest mass transit project being proposed for Bangkok (a 14.5-km LRT system) will take at least four years to build. Consideration of trip restraint and vehicle segregation measures might well prove necessary before the completion of the first mass transit project.

Trip restraint measures improve traffic circulation overall by reducing the volume of traffic, while vehicle segregation measures improve the circulation of public transport vehicles, resulting in increased bus fleet capacity and the attraction of private vehicle commuters to public transport. Recent trends in public transport patronage in Bangkok show the potential for passenger attraction to congestion-free public transport modes. These trends, assessed in an ESCAP survey, showed that even with the escalating traffic congestion of the past five years, the number of bus passengers in Bangkok grew at a rate averaging 2.9 per cent a year.³¹ By contrast, the number of passengers carried on Bangkok suburban rail services, which are relatively unaffected by road traffic congestion, but which are limited in their spatial coverage of the commuter market,

increased at a rate averaging 7.4 per cent a year (about two and a half times the rate of increase in bus passengers) over five years.

4. The manager's challenge

The experience of a very limited number of Asian cities in successfully managing their urban transport infrastructure provides good examples of what can be achieved by comprehensive and systematic planning. In such cities, of which Hong Kong and Singapore are representative, road traffic congestion is not a major problem, despite their dense populations. In these cities, planning and management of urban transport strictly conforms with strategic land use plans and the operation of public transport services is complemented by effective measures to restrain private vehicle trips (demand management) and remove obstructions to the smooth circulation of road traffic (traffic management).

However, there are many cities in the region which have yet to achieve significant success in managing the operation and use of their urban transport infrastructure. Such cities are characterized by a lack of enforcement of land use controls, a shortage of road space, a lack of restraint on private vehicle trips, ineffective traffic management measures, and extreme road traffic congestion.

While some of these cities are planning the construction of high capacity rail based mass transit systems, the extent of beneficial impact in terms of reducing road traffic congestion will depend on their spatial coverage of the commuter market and their cost effectiveness as perceived by potential users. Given their lengthy construction lead times, their benefits will not be realized in the short-term. The inescapable conclusion is that these cities must attempt to apply short-term measures aimed at trip restraint and vehicle segregation. This will provide short-term relief for the problem of traffic paralysis and boost the capacity and usage of existing public transport services. For the greater good, these measures need to be considered even if they restrict the personal freedom of private vehicle users.

G. SEAPORT MANAGEMENT AND ADMINISTRATION

Many of the management issues confronting the region's ports can be seen behind the recent trends towards privatization, for example, in Malaysia the Government initiative to follow the

³¹ ESCAP questionnaire survey of urban public transport operators for *Review of Developments in Transport and Communications in the ESCAP Region 1993* (ST/ESCAP/1333).

commercialization/corporatization/privatization path in both the ports and other sectors. Port Klang was chosen as the first candidate for privatization. Some of the reasons reported for choosing Port Klang for this initiative included:

"... the port itself was in need of a general overhaul. Although an important national priority, Port Klang was functioning at a low level of efficiency by international standards. The facility was suffering from excessive congestion; there were continuous complaints about low productivity; pilferage had reached disturbingly high levels; and security was lax by international standards. By the early 1980s, although the port remained profitable, there was mounting concern among government officials that Port Klang might be blacklisted by international shippers if conditions did not improve. It also was noted that several other countries were obtaining satisfactory performance from privately managed port facilities.

"The explanation for this sub-par performance was straightforward, according to the port manager. Operating as a government enterprise, the port did not have '... the freedom and flexibility to manage and operate its facilities on a commercial basis ... administrative and bureaucratic procedures often led to delays in decision-making and hence project implementation'. The official's frustration reflected the conflicting criteria faced by the managers of public enterprises throughout the world: 'The dilemma of the Port Authority,' he said, 'where it is expected to operate as a commercial organization on the one hand and being a statutory body subjected to all the bureaucratic procedures of a government agency on the other, led to a situation where it did not have the same competitive advantage of a business unit as other neighbouring ports'.³²

1. Typical port management issues

The types of problems outlined in this quotation are not unique to Malaysia. In considering the

problems associated with port administration, phase I of the study "Port Development Strategies for Asia"³³ noted that the crucial problems of many Asian ports included:

- (a) Politicization of port administration;
- (b) Bureaucracy in port administration;
- (c) Rigid hierarchical line organization;
- (d) Lack of formal port policy, port objectives, and port performance statement;
- (e) Lack of financial independence;
- (f) Lack of effective port operations management;
- (g) Competence of port administration;
- (h) Port marketing and user responsiveness.

At a more detailed level, typical comments which are made of the container handling operations of many ports in the region include:

- (a) Container stacking lacks planning and the existing mechanical handling equipment cannot quickly reach containers in the centre of the stack;
- (b) Mechanical failures in loading and transfer equipment are often given as the reason for inefficient and slow handling;
- (c) A lack of undercover storage results in much of the loading and unloading of containers taking place in areas exposed to poor weather conditions, often resulting in water damage;
- (d) The lack of training, supervision and discipline of handling crews leads to damage to cargo and an inefficient use of labour;
- (e) The absence of a suitable platform for communications between the port authority, customs and port users has the effect of each sector working in isolation with little consideration for the needs of others.

³² Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), *Privatization of Transport in Developing Countries*, compiled by Zdenek Havelka (Eschborn, May 1990), page 197.

³³ United States Trade and Development Program and the World Bank, *Port Development Strategies for Asia*, prepared by National Ports and Waterways Institute, Louisiana State University (May 1992).

2. Policies for efficient management

In the face of the types of problems outlined above, attention has turned towards the various forms of private sector participation, including commercialization, corporatization and privatization. While this may represent a solution to some of the problems outlined above, there are many policy initiatives, not requiring private sector participation, which could be introduced in order to improve efficiency. The main areas of concern are the administrative environment under which ports operate, the management and operation of port activities and the relationship between the port authority, customs and port users.

The main prerequisite for the adoption of effective policy measures is the identification of the specific problems arising in the port. However, in many ports of the region the management information systems are complex, out-of-date and largely produce repetitive data. They are not designed to assist decision-making or encourage management responsibilities and delegation, and they are unable to provide a comprehensive and integrated picture of the port's efficiency. In recognition of these problems, some ports of the region have introduced management information systems. One such system developed within the ESCAP secretariat is PORTMIS.³⁴

Selected examples of the promotion or implementation of private sector participation in ports of the region include the following:

Hong Kong port planning is administered by the Marine Department. However, the private sector finances the infrastructure development and leases the seabed upon which the infrastructure is built. This is arranged through Private Treaty Grant (PTG), open tender or restricted tender.

In Malaysia, in addition to privatizing Klang Container Terminal, Klang Port Authority has assumed a landlord role, selling the port operation to Klang Port Management (KPM) for MS140 million. In a first step at privatisation, Johor Port has also been corporatised and similar steps are being taken in respect of other Malaysian ports.

In the Philippines, Manila International Container Terminal was built by the public sector, although in 1988, a 25-year lease contract to manage, operate and develop the terminal was awarded. The

Government as part of its privatisation policy is also offering port development the build-operate-transfer (BOT) system. However, it remains to be seen how the private sector responds to such an investment proposition. Ports "on the list for privatization" include North Harbour, South Harbour, Batangas, Davao and Cebu. In June 1992, Cebu became an autonomous port thereby separating from the national Philippines Ports Authority.

In India, port development has been traditionally financed by grant or soft loans from international lending agencies and other bodies. The current policy direction is to invite private sector participation. For the development of coal facilities at Paradip and Ennore, ADB is likely to provide \$180 million with the private sector being given "first preference in equipping the port at Ennore". Cochin Port Trust has undertaken a feasibility study into the development of container handling facilities and has invited private sector investors to build the terminal. Kandla Port Trust has also invited private investors to participate in the creation of a container terminal either on an exclusive basis or in a joint venture with the port trust.

In Indonesia the general direction of policy is that of privatization. The first step will be the development of a coal port in the south of Kalimantan. It is understood that the Government would provide a 200-hectare area of land with private interests bearing the construction costs, for which they would be given a 30-year lease to operate the facility.

In Pakistan, Karachi Port Trust has invited expressions of interest to take over and develop/improve, operate, manage and maintain multipurpose/specialized terminals at the port on a build-operate-own (BOO) basis. Port Qasim Authority announced (December 1992) that private sector investment will finance an oil terminal (\$80 million), a grain terminal (\$20 million) and a container terminal (\$20 million). Additionally the Government would spend \$80 million on dredging and the replacement and acquisition of equipment. At Gwadar, the preliminary design of a new deep water port has been completed (estimated cost \$330 million). Currently the Government of Pakistan is considering build-operate-own (BOO), build-operate-transfer (BOT) or a mixed financing basis for undertaking this development.

At Shanghai a 50-50 joint venture of Hutchison Whampoa and Shanghai Port (Shanghai Container Terminals Ltd) will take over seven existing berths, convert four and acquire five under construction. The arrangement is for a period of 50 years.

³⁴ United Nations, *PORTMIS 2: Port Management Information System* (ST/ESCAP/1121), (New York, 1991).

Singapore is a public sector port which has recently completed the first stage of the Brani Container Terminal (total cost S\$1.4 billion). The private sector participates loosely through appropriated berth (AB) agreements. Under these agreements a shipping operator obtains priority or sole use of a

berth on condition that their annual cargo throughput reaches a minimum specified level. It has been stated that the Port of Singapore Authority (PSA) could be publicly floated in about three years' time.

Chapter IV

MEASURES FOR ATTRACTING PRIVATE SECTOR PARTICIPATION

The challenge for the countries seeking to increase private sector involvement in the infrastructure sector is in being able to put together a proposition which the private investor will find attractive but which at the same time still serves national interests in advancing effective infrastructure development.

Infrastructure investors will essentially demand an adequate return on funds commensurate with levels of perceived risk and the security of the investment. However, an attractive rate of return is still unlikely to outweigh political uncertainty and poor economic performance at levels which threaten long-term investment.

The measures required of Governments to attract private sector participation in infrastructure development relate to the creation of a favourable environment for such participation. In outlining the private investor's perspective above there were a number economic, social, political and legal considerations discussed which all form part of this environment.

Countries, therefore, need to ensure that within the bounds of their control they maximize their attractiveness as an investment proposition by addressing the areas outlined above and minimize what are perceived by investors as impediments or risks. It is also of relevance that in coming years there will likely be strong competition for private funds given the extent of infrastructure development required in the region and the limited funds available from other sources.

A. THE PRIVATE INVESTOR'S PERSPECTIVE

The overriding long-term objective of the private sector is to obtain a return on its investment of funds and other resources. In the case of significant and usually long-term investments in infrastructure the private sector takes into account the level of risk associated with particular countries, projects and financing arrangements which over the term of the investment may have a negative impact on its long-term objective.

For any potential private sector investor, whether domestic or foreign, considering investment in infrastructure, there is a range of economic and political factors specific to the country which will be considered before even proceeding to examine project feasibility. Depending on the degree of risk associated with these factors the investor may even decide not to invest in any project irrespective of projected returns and benefits.

In terms of a specific project, private sector investors will be looking to the expected return on capital employed (ROCE). Of particular interest will be the scope for deviation from the expected ROCE which could be regarded as a form of *project risk*.

Closely associated with project risk is the *financial risk* which will vary with the specific form or forms of capital participation contemplated. The corporate law in most countries recognizes a range of lenders and shareholders with different legal status, rights of access to corporate profits and creditor priorities in the event of bankruptcy. This ranking of creditors means that different categories of lenders and shareholders face different levels of financial risk.

1. Country risk and return

Factors which are endemic to specific countries will be compared on a country-by-country basis by potential investors when deciding where funds might be placed. These factors, which together dictate the level of risk, include socio/political factors, regulatory factors and economic factors.

The socio/political factors prompt the assessments of political stability or social unrest. Investors are understandably apprehensive at the possibility of major changes in policy direction or civilian or military uprisings threatening the infrastructure and revenue flows against which their investments are secured.

Foreign investors, in particular, would also review a country's regulatory and investment environment in both terms of placing and removing funds and the form of investment. A country which does not allow repatriation of profits will usually be viewed less favourably by investors than one that does. Similarly legal restrictions on private or foreign ownership and control may discourage investors.

In the latter case investors may be denied the opportunity they seek to have some say in the management of the infrastructure (and to their minds the security of their investment) and may also face problems in raising capital if they are not in possession of the very assets they are funding and therefore have no collateral.

The likely relative economic performance of countries will also weigh on investor deliberations. The prospects of developments such as fluctuating foreign exchange, recession, or higher interest rates will all impact on investors' perspectives as to which countries are attractive for investment.

In a worst case scenario the evaluation of these factors may influence investors not to invest in a particular country at all. Alternately, the investor might expect a higher rate of return on capital in recognition of higher risks. Countries wishing to attract foreign investment for infrastructure, therefore, need to minimize country risk if they are to attract funds at rates which are not prohibitive.

There are a number of organizations which produce credit ratings and indices which reflect the degree of perceived risk in investing in different countries. The journal *Institutional Investor*, for example, produces an index entitled 'Country Credit Ratings'. The country-by-country credit ratings are based on information provided by leading international banks and mainly assess sovereign risk. Bankers are asked to grade each of the countries on a scale of zero to 100, with 100 representing those with the least risk of default. The sample for the rating study, which is updated every six months, ranges from 75 to 100 banks. Table 4.1 shows the ratings for 1993. It should be noted that these ratings are for general investment. Other factors, such as government guarantees, will influence decisions. Even so, initial reviews are likely to be based on this type of indicator.

The monthly publication *Asian Business* provides similar guides through an 'Investment Risk Indicator'. This indicator uses ten economic and political indicators to give an assessment of risk potential. Table 4.2 shows by way of example the value of individual risk components in recent times for the Philippines. Table 4.3 shows the Investment Risk Indicator for selected economies in the ESCAP region.

Table 4.1 Institutional Investor's credit ratings

<i>Country/area</i>	<i>1993</i>
Japan	91.7
Singapore	80.9
Taiwan Province of China	78.1
Republic of Korea	68.9
Australia	68.1
Hong Kong	66.1
Malaysia	64.8
New Zealand	64.7
Thailand	60.8
China	57.3
Indonesia	51.5
India	38.4
Papua New Guinea	32.4
Islamic Republic of Iran	29.4
Philippines	28.0
Pakistan	27.7
Sri Lanka	25.5
Nepal	22.1
Viet Nam	19.5
Bangladesh	18.7
Kazakhstan	17.6
Uzbekistan	14.4
Myanmar	13.0
Afghanistan	10.3
Democratic People's Republic of Korea	6.3

Source: The journal *Institutional Investor* (September 1993).

2. Project risk and return

In broad accounting terms, a project's expected return on capital employed (ROCE) is the expected annualized total revenue less the expected total cost expressed as a percentage of the project's expected capital cost. At the first level of disaggregation, total revenues and costs can be broken down into their expected price or unit cost and sales volume or input quantity components as shown in figure 4.1.

Table 4.2 Investment risk components, Philippines, 1991-1993

	1991	1992	1993
(a) Inflation	2	3	6
(b) Interest rates	0	0	2
(c) Economic growth	3	1	1
(d) Infrastructure	4	4	5
(e) Labour: strife and shortages	8	7	7
(f) Bureaucratic impediments	4	5	6
(g) Government intervention in business	6	6	7
(h) Threat of armed aggression (internal and external)	3	5	6
(i) Political volatility	5	4	6
(j) The business confidence level	6	7	7
Total Investment Risk	41	42	53

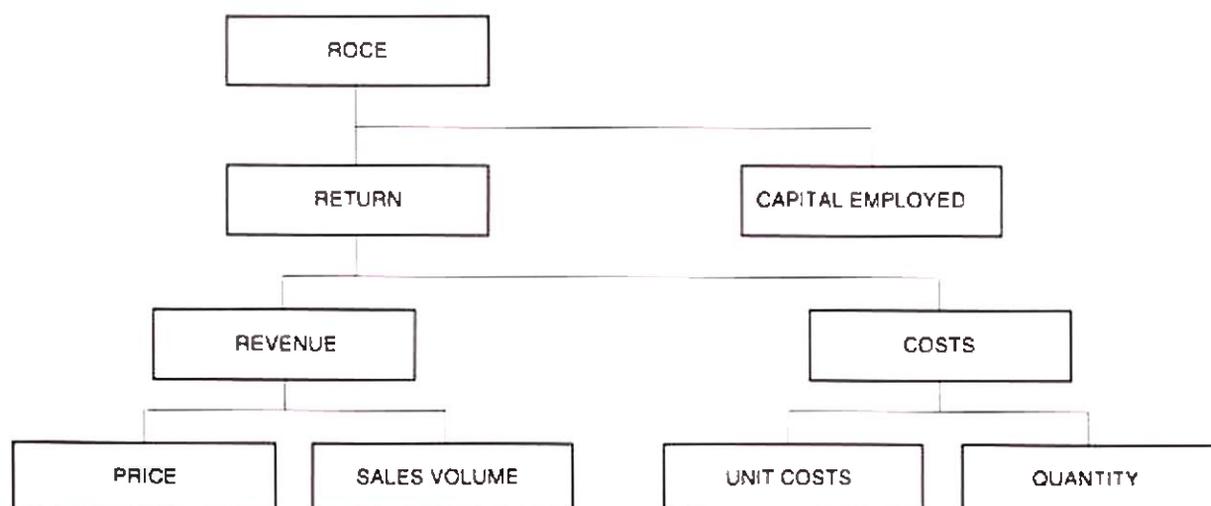
Source: The monthly publication *Asian Business*.

Table 4.3 Asian Business investment risk indicator, 1989-1993

	1989	1990	1991	1992	1993
Australia	-	65	66	-	-
China	-	-	-	-	57
Hong Kong	-	64	64	65	68
India	-	49	-	-	-
Indonesia	-	57	57	55	58
Republic of Korea	-	57	60	56	65
Malaysia	-	64	70	68	67
New Zealand	-	69	-	-	-
Philippines	-	-	41	42	53
Singapore	-	75	7	73	75
Taiwan Province of China	70	65	6	68	70
Thailand	-	69	6	61	64
Viet Nam	-	-	-	-	53

Source: The monthly publication *Asian Business*.

Figure 4.1 Components of return on capital employed (ROCE)



A project can fail an *ex ante* expected ROCE test (ROCE less than a minimum specified percentage return on investment) because the sales price or volume or both are too low, unit costs or input volumes are too high or because the capital cost is too high.

Examples of the causes of failure of such a test include:

- (a) Government controls which keep prices at a level where revenue is too low or taxes on income high;
- (b) Inability of consumers to pay – no feasible pricing structure can be developed to raise sufficient revenue;
- (c) 'Smallness' of the market – owing to the size of the market, output/service at any feasible price is not high enough to raise sufficient revenue;
- (d) High taxes on inputs leading to high expected costs;
- (e) High transport costs of inputs again leading to high expected costs;
- (f) Requirement that the project absorbs various welfare costs;
- (g) Inefficient management and operation requiring that for a given output more inputs are required and consequently operating costs are too high;
- (h) Inefficient management during the construction phase or the use of inappropriate technology which leads to high capital costs.

Ex post a project may not achieve its expected ROCE because prices, costs and volumes (or quantities) deviate from their expected values. The risks associated with these deviations from expected values can be separated into those arising during the construction phase, which mainly affect the capital cost (although errors occurring in design or construction can lead to expenditures which are capital in nature at a later date), and those arising during the operation phase, which affect current revenues and expenditures.

The principal project risks faced during the construction phase are completion delays, cost overruns and *force majeure* (unforeseeable course of events excusing the fulfillment of a contract).

The main project risks that can arise during the operation phase are:

- (a) The introduction of price controls or 'slow' implementation of 'agreed' price adjustment procedures;
- (b) Inability to supply the expected output volume owing to physical damage, labour unrest (strikes) and general operational reasons;
- (c) Increases in input prices;
- (d) Changes in taxation regimes;
- (e) Inability to acquire the required inputs;
- (f) The operating leverage of the project (that is, the proportion of fixed costs in total costs) – a project with a high proportion of fixed costs has little scope to cut costs during a period of low demand;
- (i) Introduction of retrospective safety and environmental legislation and regulations.

Several of these project risks may also impact on the cash flow resulting in projects which may pass on a ROCE test but still face bankruptcy. Many aspects of project risk (and some aspects of country risk) giving rise to investor uncertainty can be addressed through contract negotiation. Investor concerns over the possibility of currency fluctuations, for example, can be accommodated by expressing returns in, say, US dollars. Similarly, investor doubts about achieving required volumes of revenue flows can be addressed through guarantee provisions. Countries or businesses entering such contracts, however, need to be fully aware of the scope and form of their liabilities.

It has been reported, for example, that the Government of India is opposed to an outright sovereign guarantee for foreign equity and borrowing in private power projects because the massive contingent liabilities arising could impact on India's credit rating and lead to an overall increase in the cost of funds.¹

3. Financial risk

There are elements of financial risk associated with both country risk and project risk. In a country risk sense the regulatory framework for foreign investment can act as an impediment to investment by restricting the roles of investors.

¹ 'Power Play', *Far Eastern Economic Review* (15 April 1993).

In a project risk sense there will be a financial risk for an investor depending upon the participatory role he seeks or is able to negotiate in respect of any particular project. One investor may prefer to participate through a direct and more secure investment while others may prefer to operate as an equity participant with the prospect of capital appreciation as well as profit sharing.

The challenge for the country or project manager is in being able to put together a proposition which investors will find attractive in terms of preferred levels of financial risk but which at the same time still serves national interests in advancing effective infrastructure development.

4. Laws and regulations for private sector participation

In the past there has not been the need for private ownership of traditional public sector infrastructure. In addition the transfer of rights to foreign interests has been considered as a matter of strategic importance. The result has been that legislation has not been enacted which supports private ownership and in some cases existing laws prevent it completely. For many of the countries moving toward an increased role of the private sector there is, therefore, an urgent need to put in place the basic laws and regulations which will clarify the rights and responsibilities of the public and private sectors. This activity is an important, if not essential, prerequisite for successful privatization. Without the necessary elements being in place negotiations are more complicated and the private sector perceive an increased level of risk.

Clear and precise definition of the level of control that the Government may retain in terms of performance monitoring, pricing, employment as well as the methodology of guaranteeing projects is also fundamental to the level of confidence the private sector will have in participating in particular infrastructure projects. A careful balance is required between offering the private sector the flexibility to perform while at the same time providing the necessary safeguards for public and national interest.

Issues which need to be addressed include:

- (a) **Ownership:** the establishment of legal ownership including the level, if any, of retained domestic or government ownership if foreign investors are involved;

- (b) **Corporate law:** review of the definition of juristic persons to encompass foreign owned companies within the national law and to specify the formation of such companies;
- (c) **Arbitration:** the role of national courts of law in arbitration procedures and in the case of foreign ownership third country arbitration arrangements;
- (d) **Status of foreigners:** the provision of work and stay permits for employees and representatives of overseas private sector investors;
- (e) **Repatriation of funds:** the convertibility of profits and cash flows into hard currencies and their removal from the country;
- (f) **Accounting practices:** the adoption of international accounting practices, for example, in the area of depreciation which can have a significant effect on project returns;
- (g) **Pricing:** the level of freedom that will be accorded the private sector in establishing and changing prices;
- (h) **Taxation:** corporate, value added tax (VAT) and personal tax levels, including details of tax holidays that may be offered to private sector investors.

B. MODES OF PRIVATE INVESTMENT

A range of financial instruments are being increasingly used in the region to facilitate development through private sector investment. The main forms of private sector participation are direct loans, the sale of bonds, management contracts, leasing, franchising, build-operate-transfer (BOT) arrangements, joint ventures, equity participation and full privatization.

1. Direct loans

The simplest means of accessing private sector funding is through direct commercial loans from domestic or overseas financial institutions. In practice, however, the large sums required for infrastructure financing will in most cases not be available from single lenders but require syndicated financing. Direct lenders usually demand some form of security.

Commercial direct borrowing is a major source of funds for the wholly government-owned Hong Kong Mass Transit Railway Corporation (MTR). This highly regarded corporation is by its own words "one of the few underground mass transit railways in the world which can cover operating costs and depreciation by unsubsidised fare revenue and generate a satisfactory operating profit".² The MTR also prides itself on its reputation and its rating by one source as a secure borrower being ranked third in the world in 1989 behind the World Bank and the Kingdom of Sweden.

Construction of the Shanghai Yangpu bridge in China is being financed in part by a syndicate of financial institutions.³ Of the \$250 million cost of the project around 34 per cent is being provided by the Asian Development Bank (ADB) and the Municipality of Shanghai; the remaining 32 per cent coming from a syndicate of local and overseas financial institutions (six banks and a life insurance company) under commercial co-financing arrangements organized by ADB and including an ADB guarantee.

2. Bonds

The financing of investment through bond issues has been practised by public utilities in developing countries for some time. The issue of bonds for sale does not, however, guarantee that the bonds will be taken up. In China, for example,⁴ it has been reported that fewer than 15 per cent of treasury bonds (carrying an interest rate of 10 per cent) issued at the beginning of 1993 had been sold by May that year. One of the contributing factors being the higher interest rates offered by, for example, the port of Shanghai (15 per cent) and Fujian province (26.67 per cent).

One of the differences between the sale of bonds and the remaining forms of private sector participation is that, given the level of guarantee attached to interest payments and capital repayment at maturity date, the sale of bonds represents a source of funds only and does not usually entail any of the management changes, institutional changes or technology transfers which are quite often being sought within the remaining forms of private sector participation.

² 1992 *Annual Report*, Hong Kong Mass Transit Railway Corporation.

³ Programs Department, Asian Development Bank.

⁴ Agence France Press, reported in *Bangkok Post* (6 May 1993).

As standards of living and volumes of savings rise in many Asian countries and their financial sectors increase in sophistication with the development of pension funds, mutual funds and other investing financial institutions, there will be increased opportunities for utilizing bond issues to mobilize local resources.

Local bond issues may not only provide increased freedom from foreign exchange risks but are also likely to lead to cheaper funds. The Mass Transit Railway Corporation of Hong Kong, for example, is reported to have raised over \$200 million in April 1993 through a bond issue at rates below bank loan rates.⁵ However, it should be noted that bond issues can be used to raise overseas funds, but the experience to date appears to be that only high profile, blue chip borrowers are able to use this technique.

3. Management contracts

Under a management contract, the owner of the infrastructure facilities provides all of the fixed assets and equipment with the contractor providing key management and operations personnel. This form of participation can assist in the important area of transfer of management know-how usually with the contractor being from the same industry. It is often intended to improve performance and profitability, thereby enhancing debt servicing capabilities. However, it does not resolve any problems associated with the initial funding of projects unless it is part of the project package which may be more attractive to private sector investors.

4. Leasing

A long-term lease of a facility usually requires the private sector to make annual payments, sometimes linked to production output, thereby providing a revenue stream. Under this type of agreement, the public sector provides the 'permanent' assets, including some heavy plant, while the lessee provides the equipment and runs/maintains the facility for the duration of the lease as though it was an owned asset. This type of agreement is used in the ports sector in a number of ESCAP member countries, such as Laem Chabang, Thailand.

This form of participation at a node such as a seaport is attractive because the investment

⁵ Neal McGrath, "Funding for Every Occasion", *Asian Business* (July 1993).

required in modern cargo equipment is significant. In addition, it can also provide the opportunity for the transfer of technology and development of port operations and management skills. For the power sector similar conceptual separations can be made between generation and distribution.

For the infrastructure links (railways and roads), separations can be made between the provision of the permanent way and the provision of the rolling stock or vehicles. In the United States of America, for example, most of the inter-city rail passenger services were nationalized and passed into the control of Amtrak in 1971 (passenger services were generally regarded as unprofitable and the private companies sought to abandon them). Amtrak owns their locomotives and passenger cars and has the right of access to the national rail network which is still owned by private companies and which still carries freight.

Another form of agreement which provides the opportunity to involve the private sector in providing infrastructure services is franchising. This approach is similar to leasing but instead the 'asset' provided by the Government is the right to undertake an activity, such as providing a bus service, rather than right to use government developed property. In Hong Kong, for example, bus services are provided by private companies which under franchise have the exclusive right to specified routes. All capital and operating costs of servicing the routes are met by the bus companies which operate on commercial principles under a profit control scheme. While the buses are privately owned the Government still regulates the industry in terms of fares and routes. Interestingly enough the Mass Transit Railway (MTR), while Government owned, is not subject to such controls.

5. Build-operate-transfer arrangement

What is BOT and how does it work?

The form of private sector participation which is currently receiving considerable attention in the region is build-operate-transfer (BOT). It represents a form of infrastructure development in which a developer will enter into an undertaking with a Government or government agency to plan, design, construct and operate an infrastructure facility, such as a power station, in exchange for the concession to receive revenue from the commercial operation of the facility. The ownership of the facility reverts to the government sector at the end of the contract. Selection of a developer is undertaken by the tender process.

The contracts are for quite lengthy periods, typically around 30 years. Such long periods are required because infrastructure development (for example, power stations, roads, and ports) involves large volumes of capital and the servicing of that capital is based on future cash flows (i.e., power charges, road tolls, and berthing fees) arising from the operations of the infrastructure. The levels of revenue flows are in turn dependent on the affordability of the charges made to users of the infrastructure. There is also, of course, a significant lead time for construction of the infrastructure when the developer is not receiving any return on the investment.

The BOT approach is suitable for any infrastructure where a payment for usage can be exacted. Suitable infrastructure, therefore, includes bridges, roads, airports, water and electricity supply, railways, urban transit systems, and telecommunications. There are a number of variations of this style of funding arrangement including BOO (build-operate-own), BLT (build-lease-transfer), RLT (rehabilitate-lease-transfer), ROT (rehabilitate-operate-transfer).

The funding arrangements for BOT projects usually involve multiple debt and equity participants. This is because individual financiers are often reluctant to commit themselves to large sums over long periods. In addition, operating a BOT project will often be managed by one of the BOT private sector partners and the other participants would encourage such an operator to take an equity position.

Utilizing the BOT approach

The BOT approach can provide a valuable means of providing needed infrastructure in countries lacking either the funding or the expertise to develop it themselves. It is not an approach, however, that will necessarily work in or is suitable for all countries, or for all projects. For example, the private sector is unlikely to be attracted to projects which may have potentially significant economic benefit but poor financial returns. The approach is relevant where countries are subject to budgetary constraints or are looking to avoid increasing government indebtedness or to obviate public sector borrowing limits.

Inherent in the approach is the tenet that any project contemplated for development under BOT must be able to attract the interest of developers on purely commercial grounds. This means effectively that BOT projects must compete in capital markets

for funds on the basis of returns, risk etc. Regardless of the viability of a project, potential investors have to contemplate their participation against their investment flexibility needs and the likely long-term attractiveness of anticipated rates of return.

For some countries the cost of BOT projects may simply be too expensive. The cash flows generated by the infrastructure users need to be sufficient to service the project's debt at commercial rates and provide a return to equity participants and the developer. A critical factor, therefore, is whether the resultant costs to consumers of using the infrastructure are both affordable and acceptable. In Bangkok, for example, it has been reported⁶ that the doubling of the tolls on the city expressway system following the opening of the BOT second stage expressway saw motorists reluctant to pay the toll and reverting to the regular streets. However, this situation has again been reversed with heavy usage of the expressway.

There may be circumstances under which a Government is prepared to pursue a BOT project even though realizable cash flows may not be adequate to service project costs. A Government might proceed with an urban mass transit system under BOT and attract investors even though project costs cannot realistically be met on a "user pays" basis. Government provision of fare subsidies needed to encourage patronage might be justified in terms of resultant relief to chronic traffic congestion and downstream economic and environmental benefits.

For some countries the decision to acquire infrastructure on a BOT basis will also be influenced by the need to ensure it is managed and operated efficiently in the absence of local expertise and experience. The BOT approach provides an opportunity for transfer of knowledge and the development of local resources which can be drawn upon by the host economy in later infrastructure development.

The main criticism of BOT development is that it is relatively expensive and the rates of return sought

⁶ 'Road Less Travelled'. *Far Eastern Economic Review* (16 September 1993).

by investors are high. One analysis of BOT financing⁷ has identified five factors contributing to the costs of BOT financing:

- (a) *Illiquidity* – investors seek a premium for holding very long-term fixed assets;
- (b) *Small capitalization* – reflecting investment in a single activity enterprise;
- (c) *High overheads* – reflecting the cost of setting up a complex project;
- (d) *Risk creation* – multiple risks are associated with BOT structure;
- (e) *Risk duplication* – the structure of BOT leads to exposure overlap.

The same study also saw a weakness in BOT projects whereby the investment decision was made by the Government in terms of the nature and location of the facilities. Private sector involvement should, however, be predicated, among other things, on the commercial viability of a project. A poor government investment decision is unlikely to attract BOT bids.

While the BOT approach may be seen as a relatively expensive solution to meeting infrastructure demands, developing countries with their limited resources may not have the luxury of a range of financial options to choose from. It may be a case of BOT, or similar private investment schemes, or no infrastructure at all.

The Philippines, for example, has responded to the power capacity problems that have emerged in recent years through an extensive programme of power generation projects based on BOT. It has been reported⁸ that BOT might not have been the financing of choice, but "given the paucity of government resources and the level of present need" the Philippines had little choice but to seek private investment for its power sector.

⁷ Stephen Morris, *Financing Private Infrastructure Projects: a Financier's View*. Australian Bureau of Industry Economics Occasional Paper 7. Private Provision of Infrastructure (June 1992).

⁸ Eapen Thomas, 'Manila Lightens Up', *Infrastructure Finance* (Fall 1993).

Box V. ASPECTS OF ATTRACTING BUILD-OPERATE-TRANSFER (BOT) INVESTMENT

BOT investment is one of the means of attracting private sector participation in infrastructure development which is currently receiving considerable attention. In considering this type of investment, countries need to assess whether the proposed project would be of interest to the private sector. It must also be borne in mind that BOT requires a complex set of contractual relationships which need to be clearly understood by all parties.

With infrastructure financing typically involving long maturity periods, investors will be looking, especially in developing countries, for assurance against foreign exchange risk. Concern is likely to cover not just national policy in this area, but also general economic performance and the country's ability to provide, and if necessary deliver, exchange guarantees. Countries who proceed with foreign private investment backed projects also need to be aware of the foreign exchange factor when developing project agreements.

With a BOT project, where project earnings are guaranteed in US dollars any devaluation of the domestic currency, or increase in the value of the dollar, could lead to dramatic increases in charges for the use of the infrastructure and the possible need for government subsidies.

The financial position of the Light Rail Transit Authority (LRTA) in Manila, for example, was severely impacted by currency fluctuation. Construction of stage one of the light rail project (which commenced operations in 1984) was funded through an overseas loan. While the facility has operated soundly since its introduction with increasing patronage and revenues, changes in the value of the peso, from 7 pesos to the US dollar in 1986 to 28 pesos in 1992 have certainly impinged on the servicing and retirement of the overseas US dollar debt. LRTA officials have indicated that despite achieving a fare box ratio (fare receipts/operational expenditure) of 1.76, which they describe as the second highest in the region after Hong Kong (2.1), a doubling of fares would be necessary to meet all current overheads.

Given the sums of money involved in infrastructure projects a country which does not allow repatriation of capital and profits is unlikely to attract foreign investment. Any restrictions on foreign ownership similarly provide a fundamental barrier to the pursuit of BOT with foreign backing.

It is not sufficient to possess an appropriate regulatory environment. Potential investors and developers must also feel confident that the legal and regulatory institutions operate in a transparent and equitable manner. If a developer has to fall back on a local judicial system he wants to feel he will receive fair and just treatment. This is especially important with BOT agreements because all parties look to protect their interests and BOT agreements commonly feature default arrangements and buy-out terms.

Even with an acceptable regulatory and legal environment investors need to feel comfortable about political predictability and reliability. A country's record in dealing with private and foreign investment will certainly be addressed in any project assessment. The dispute between the Bangkok Expressway Company Limited and the Expressway and Rapid Transit Authority of Thailand over the Bangkok second stage expressway, for example, has been noted¹ for its possible relevance to Thailand's future ability to attract foreign investment for infrastructure projects.

Absolute prerequisites for any country contemplating attracting private foreign BOT investment are receptive ownership and control regulations. The "own/operate" nature of many BOT style models is such that restrictive foreign investment/control regulations could preclude utilization of that form of investment. In China for example while BOT is being successfully used for power and road projects there are impediments to applying the concept to the development of telecommunications and ports because of ownership constraints.

Two countries, which have taken positive steps to attract private investment in the form of BOT are the Philippines and Viet Nam. On April 1993 the Government of Viet Nam issued Decree No. 18-CP, which was designed to attract foreign investment in infrastructure projects. The decree authorizes BOT projects and implements amendments to the Law on Foreign Investment.

It is reported⁷ that under the decree BOT projects can be implemented by 100 per cent foreign-owned enterprises, or jointly with the Government or private enterprises, and there are no time limits on the length of BOT projects. According to the decree time periods should be long enough for investors to recover their investment and earn a reasonable profit. Thereafter the project must be transferred to the Government without cost.

In July 1990 the Philippines Congress passed Republic Act No. 6957 which authorized the financing, construction, operation and maintenance of infrastructure projects by private companies, removed previous foreign ownership constraints, provided tax holidays and allowed repatriation of profits. The Government of the Philippines had previously taken action to allow the private sector to generate power as well as the National Power Corporation.

Note: ¹ Paul Handley, "Road Less Travelled", *Far Eastern Economic Review* (16 September 1993).

² "Viet Nam Goes BOT", *Infrastructure Finance*, Fall 1993.

The regional BOT experience

The first acknowledged major BOT project in the region was the 700 megawatt Shajiao B power station in China which was developed by the Hong Kong company Hopewell Holdings and completed in 1987 at a cost of \$512 million.

Prompted by the success of the Shajiao project a number of other BOT projects have subsequently been initiated in the region including:

- (a) A 210-megawatt gas turbine electricity generator at Navotas in the Philippines at a cost of \$41 million which was commissioned in 1991;
- (b) A 100-megawatt expansion of the Navotas facility costing \$40 million;
- (c) The Bangkok second stage expressway costing over \$600 million which was opened in 1993;
- (d) A 123-kilometer highway costing \$1,200 million currently under construction in China between Shenzhen and Guangzhou and scheduled for completion in 1994;
- (e) A 700-megawatt thermal (coal fired) power station at Pagbilao, Quezon in the Philippines costing \$933 million to be commissioned in 1995/96;
- (f) A 22-kilometer ring road costing \$174 million completed in Guangzhou, China in 1993;
- (g) The \$1,250-million Malaysian North-South Expressway;

- (h) The \$400-million harbour tunnel in Sydney, Australia completed in 1992;
- (i) The construction of a 600 megawatt coal fired power plant in Guangzhou, China costing an estimated \$600 million which commenced in 1993;

A number of countries are seizing upon the BOT model and making it the backbone of their infrastructure planning strategy. The Philippines falls into this category and has put together a BOT investment programme. The short list of this programme includes 17 projects costing \$3.2 billion and covers infrastructure, such as light rail, airport terminal facilities, heavy rail, telecommunications, power projects, bridge and road works and water supply. The full list of projects, which relates to all projects potentially implementable as BOT, consists of 163 projects costing \$17.2 billion. This list, moreover, does not include seven major electricity projects for which financing is assumed to have been secured.

Pakistan's Water and Power Development Authority is similarly relying heavily on BOT financing to support its power generation expansion programme over the period 1992-1998 with nearly a third of the anticipated 7,600 megawatts additional capacity planned to be built by the private sector on a BOT basis.⁹

Examples of BOT style projects under negotiation or planning consideration in the region include:

⁹ Asian Development Bank, *Electric Utilities Data Book for the Asian and Pacific Region, 1993*.

- (a) The 1,292-megawatt Hub River power station in Pakistan estimated to cost \$1.3 billion;
- (b) A \$90-million grain terminal in Manila;
- (c) Up to five extensions of the urban light rail system in Manila costing over \$1.5 billion in total;
- (d) A road that will in 1998/99 link the Guangzhou Shenzhen Zhuhai Superhighway with Hong Kong's planned new airport at Chep Lap Kok at a cost of around \$1.4 billion.

6. Joint ventures

The current practice of joint ventures being used in, for example, China is largely based on variants of leasing and BOT. At Shanghai, the port and Hong Kong International Terminals (HIT) have formed a separate company - Shanghai Container Terminals Ltd - under a 50-year agreement. This 50-50 joint venture company will take over seven existing container berths, five container berths currently under construction and four conventional berths which will be converted to container berths.

Press reports¹⁹ suggest that the port's contribution to the joint venture was the (re)valued assets (including land use) while HIT's contribution was the means of improving throughput. Apparently, during

¹⁹ Lloyd's List *Maritime Asia* (June 1993), pp. 32-33.

negotiations, HIT suggested that it should receive payment for transfer of knowledge, while the port suggested that it should receive payment for access to its market. In the event, no specific payment was made for the transfer expertise in improving throughput.

7. Privatization

The process

The process of privatization can involve both the conversion (sale) of existing public sector assets and facilities while providing the private sector access to an infrastructure market with the intention of increasing the number of industry participants and creating a competitive market. The privatization of public sector facilities can be undertaken in a number of ways from inviting bids from private companies to listing the company on the local stock exchange and selling off equity.

BOT is a form of privatization in that the developer owns or at least has the right of access and operates the infrastructure for the period of the BOT agreement. The essential difference between the BOT approach to funding and privatization is that BOT is normally used for individual projects or assets whereas privatization is applied on an industry basis and normally confers on the private operator the right to undertake an activity. BOT projects also normally involve Governments in the formulation of planning and commercial

Box VI. PRIVATE SECTOR PARTICIPATION AND REGIONAL ECONOMIC COOPERATION

The private sector can complement the public sector in the provision of infrastructure facilities. One such example is the joint venture between Thailand's Shinawatra Group and Isla Com Corp of the Philippines in the development of the Philippines' largest telecommunications project.

The project will involve joint investment of \$1.2 billion (30 billion baht) to install 700,000 lines throughout the country. This, the first telecommunications contract between the Philippines and Thailand, involves a 30 per cent investment by Shinawatra International Co., the Shinawatra Group's international investment arm.

The joint venture firm will reportedly have a capitalization of \$200 million and will eventually be listed on the Philippine stock exchange.

Other proposals made by Shinawatra to the Philippines Transport and Communications Ministry in August 1993 include the development of a local telephone network, an international network via satellite and the introduction of value added services.

Shinawatra plans to have two satellites, with a total of 12 transponders, positioned above the Philippines.

Source: *Asian Communications* (January, 1994).

arrangements. Under the pure privatization approach such functions are left to the private sector.

Privatization benefits

Some major benefits of privatization are seen to be:

- (a) Maximizing the efficiency of the delivery of services through the combination of operation on commercial principles and exposure to competitive forces;
- (b) Achieving an equitable basis for charging for infrastructure delivery with the users paying and cross-subsidies removed;
- (c) Removing the political and public sector budget factors from the infrastructure management and investment decision-making process.

From a Government's perspective privatization can be financially attractive. Even successful government trading enterprises can be expected in the long term to seek capital injections if they are to be able to compete effectively. Inefficient enterprises may require regular subsidization. Privatization not only removes such expenditure from the government budget but can provide attractive short-term capital recovery from the proceeds of sales of enterprises or market access. It has been reported¹¹ that since 1980, some 80 countries around the world have undertaken privatization programmes and around 8,500 state-owned enterprises have been sold off generating \$328 billion in government receipts.

From the enterprise's perspective, privatization is attractive in facilitating capitalization and competitiveness. As mentioned above public enterprises with high debt gearing are generally at a competitive disadvantage, compared with their private sector counterparts. Moreover their success in obtaining capital from their owner, the Government, will rely on their ability to compete for funds against all the other demands for public funding, rather than the level of efficiency of the use of the capital.

From the point of view of the general public, privatization can lead to improvement in the

efficiency of existing infrastructure in developed countries, to an inflow of private sector funds and the speedier development of needed infrastructure.

A concern of the general public can be that different attitudes may prevail towards cross-subsidization and that services previously provided by the public sector might be charged at full cost recovery, or at the extreme, not provided at all by a private owner. A privatized bus company, for example, in keeping with its profit objectives, might not want to provide services on uneconomic routes which might previously have been served by public sector buses on community service grounds. This is one of the reasons why the Hong Kong Government retains control over the routing of its franchised bus services. Similar conflicts can arise in the provision of services such as electricity and telecommunications to rural areas. The high capital cost of extending services to low population density communities can result, without some form of cross-subsidization, in cost recovery levels which are not affordable by those communities.

A further concern of the employees of an organization which is proposed to be privatized relates to any possible change which may occur in their pay, benefits, job security and status. In the case of the privatization of the Kelang Container Terminal there were complex negotiations between the civil service union and the management of the new company. The outcome was that container terminal employees were given the opportunity to select one of three options:

- (a) To take a lump sum severance package and/or early retirement which included pension benefits;
- (b) To remain as an employee of the Port Authority; or
- (c) To terminate their employment with the Port Authority and become employees of the new company on overall terms and conditions which were no less favourable than those offered by the Port Authority.

Applicability of privatization

Because private sector investment seeks a reasonable (by market standards) rate of return, privatization is generally limited to infrastructure with a profit potential. The accumulated debt and continuing operating deficits of most railways in the region, for example, have limited the opportunities for privatization of rail services.

¹¹ Sara Khalili, "The Uneven Triumph of Privatization", *Infrastructure Finance* (Fall 1993).

Full privatization also needs to be examined carefully as a policy option under circumstances where there is a natural monopoly, such as the provision of water services, or where the size of the market is such that it will not support a number of players. Under such circumstances uncontrolled single operators are in a position to charge whatever they think the market can bear. Therefore, some form of regulatory mechanism may be required.

In many instances countries are looking to improve the performance of infrastructure in the uneconomic and natural monopoly categories through corporatization or partial privatization. Corporatization involves the reorganization of government business undertakings as corporations with management and financial autonomy but with Government remaining as the sole shareholder.

Privatization investors appear to show a distinct preference towards public sector trading enterprises that have been commercialized and corporatized. This is not surprising as the accounts and performance of such enterprises provide a transparent guide to the enterprises' financial position and ability to operate independently of the Government. Governments, therefore, often pursue commercialization and corporatization as a prelude to privatization.

Partial privatization involves sale of only a portion of equity and leaves the Government able to exert some control over the policies of the enterprise through its position as a significant shareholder. Partial privatization can also be a means of phasing privatization, giving the Government some measure of control through the vulnerable formative periods of market expansion.

Competition benefits can also be realized through contracting out specific services or functions on a tender basis. The stevedoring activities of handling cargo from ship to shore, for example, are frequently carried out under contract.

The regional privatization experience

Telecommunications is the area of infrastructure in which privatization has been utilized the most. Among the developed countries Japan's Nippon Telephone and Telegraph was partly privatized (34 per cent) and at the same time the market opened to other participants in 1987. Three other private carriers have subsequently entered the long distance phone market, and rates have been cut five times and are now 60 per cent cheaper than in

1987.¹²

The other developed countries have also liberalized telecommunications. New Zealand Telecom was corporatized in 1987 and privatized in 1990 raising \$2.5 billion. Telecommunications are now not only more efficient (95 per cent digital) but also cheaper. Long distance call costs have been reduced by 60 per cent.¹³ In Australia a second telecommunications carrier was licensed in 1991 and the government carrier Telecom was merged with the prior overseas call carrier and corporatized.

Privatization has not been restricted exclusively to the developed countries. Singapore Telecom was corporatized in 1992 and was expected to be offered for sale in 1993. Malaysia has corporatized and partly privatized its carrier, now Telecom Malaysia. In Pakistan the public operator is being privatized. In India, Indonesia and Thailand competition is allowed in some services.

Privatization in the air transport sector has been restricted to date to air carriers rather than airports. In 1990 the New Zealand Government fully privatized Air New Zealand. During 1992 the Australian domestic carrier Australian Airlines was fully absorbed by the international carrier Qantas which in turn was offered for sale by the Australian Government with British Airways purchasing a 25 per cent share. In early 1992 the Government of the Philippines sold a 67 per cent share in Philippine Airlines to local investors, and a minor proportion of shares in Thai Airways International was floated on the Stock Exchange of Thailand. The Government of China has, since 1985, pursued a policy of encouraging provincial governments to establish their own carriers. By early 1993 there were 16 semi-private carriers operating in China.

It has been reported¹⁴ that airlines are difficult to sell at the moment when confronted with volatile fuel prices, poor ticket sales, fierce price competition and concern about terrorism.

The tendency with airports has been toward autonomous public authorities or corporations rather than privatization. This has happened to varying degrees, for example, in Australia, China, Malaysia, New Zealand and Thailand.

¹² "Holding the Line", *Far Eastern Economic Review* (1 July 1993).

¹³ "Wellington's Solution", *Far Eastern Economic Review* (1 July 1993).

¹⁴ Sara Khalil, *op. cit.*

In the power infrastructure sector the State Electricity Authority of Victoria, a state-owned enterprise in Australia, was able to secure the funding it required for the development of its 1,000 megawatt Loy Yang B power station by selling a 51 per cent interest in the project to private interests as part of a \$1 billion privatization process.¹⁵

Similarly the \$2.5 billion Dabhol LNG fuelled power station in India will be 100 per cent owned by two United States companies. Electricity output will be sold to a state utility for distribution.¹⁶

One of the barriers to privatizing railways and public transport utilities in the region is typical large financial deficits and debt accumulation incurred by rail enterprises. The only examples in the region of privatization of rail have been the former Japanese

National Railway in 1987 and the sale of New Zealand Railway Ltd in 1993. Both transactions were preceded by a buy out of railway debt (\$245 billion in Japan and \$625 million in New Zealand). The Philippines National Railway has announced a reform strategy leading to privatization, but will also have to overcome the problem of significant accumulated debt (around \$90 million).

Malaysia has also shown that privatization can work in the port sector. The Port Klang Container Terminal was incorporated in 1985 in preparation for privatization and in 1986 a 51 per cent share was sold off to private interests.¹⁷ The remainder of the port has subsequently been privatized and other Malaysian ports are going through a process of corporatization as a prelude to possible participation.

¹⁵ Andrew Hall, 'An Australian Experience', *Infrastructure Finance* (Summer 1993).

¹⁶ Hamish McDonald, 'Power Play', *Far Eastern Economic Review* (15 April 1993).

¹⁷ Sara Khalil, *op. cit.*

Chapter V

INFRASTRUCTURE DEVELOPMENT THROUGH REGIONAL COOPERATION

In its broadest sense, international or regional/subregional cooperation could be understood to mean any activity jointly undertaken by several economies which is perceived to be to their mutual benefit.

The bilateral development of infrastructure facilities in, for example, the power sector is providing a major revenue source and is equipping a number of least developed countries with the potential to develop their manufacturing sector. Without such bilateral cooperation the projects would not have been feasible. In addition, the cooperation has facilitated the financing of the projects.

Recognizing the wide scope of the possible areas and forms of cooperation, the Commission resolution 48/1 of 23 April 1992, "Declaration on enhancing regional economic cooperation" placed high priority on economic cooperation on the promotion of intraregional trade and investment, greater cooperation in science and technology and on the development of infrastructure.

The three main areas in which ESCAP member countries can cooperate in the development of infrastructure are:

- (a) **Sharing of Experience and Human Resources Development:** The sharing of experiences and transfer of expertise, skills or knowledge in infrastructure planning, finance, development, administration, management, operation and maintenance;
- (b) **Regional Policy and Regulatory Environment Development:** Consultation on the planning and development of physical infrastructure and an appropriate regulatory environment between countries;
- (c) **Joint development of mutually beneficial infrastructure projects.**

This chapter discusses these three areas while chapter VI contains specific recommendations concerning the areas where regional cooperation can play a major role.

A. SHARING OF EXPERIENCE AND HUMAN RESOURCES DEVELOPMENT

Not only are there considerable differences in the stages of economic development which countries of the region have reached, but also many countries have adopted different approaches to the provision of infrastructure facilities. Consequently, there is a firm basis for the sharing of experiences in infrastructure development through regional cooperation.

Although many countries of the region have expressed considerable interest in such sharing of experiences, the major issue relates to the strengthening and development of mechanisms whereby the potential benefits of these exchanges can be realized.

In order to participate in such sharing of experiences each country needs to have knowledge of the approaches adopted in other countries. A number of measures which would greatly facilitate such sharing of experiences would be the cataloguing of experiences in infrastructure development, the dissemination of information concerning the areas in which the country would be willing to share experiences, a description of the needs of different countries and the nomination of country focal points through which enquiries can be channelled and appropriate action taken.

To undertake such activities effectively, a mechanism or institutional arrangement is needed. One of the cost-effective mechanisms could be networking among the interested countries, organizations or institutions. Another mechanism could be the establishment of an association or council of interested parties. In all such cases, a cost-effective small-scale secretariat would be required to take the initiative to promote cooperation in experience sharing and to undertake the activities outlined in the paragraph above.

One of the most successful examples of networking in which the ESCAP secretariat was instrumental is the "CITYNET" (A Regional Network of Local Authorities for the Management of Human Settlements). CITYNET grew out of the desire of many cities in the region to exchange substantive information on operational skills and technology in urban planning and from the recognition that organized cooperation between cities, non-government organizations and community organizations, was an essential linkage for the effective improvement of urban management. The CITYNET secretariat is headed by an elected Secretary-General and supported by a small staff. The city of Yokohama, Japan, provides host facilities, including office space, furniture and other equipment for the secretariat which includes clerical and professional staff.

CITYNET serves as a catalyst to encourage partnerships for the technical exchange of expertise among local authorities and all other organizations and individuals interested in urban development. It also contributes to self-reliant development and international understanding.

It implements the following types of activities:

- (a) Arranges technical advisory services from one to the other member, on request;
- (b) Organizes training activities and study tours in areas of common interest among several members;
- (c) Promotes joint applied research in areas of common interest among some members;
- (d) Prepares documentation on urban development experiences for wider dissemination;
- (e) Maintains a regional data bank;
- (f) Issues a newsletter at regular intervals.

The CITYNET approach could be usefully examined as a potential basis for networking in various subsectors of infrastructure.

Another important area of cooperation is the sharing of experience between subregional groupings, such as Economic Cooperation Organization (ECO), South Asian Association for Regional Cooperation (SAARC), the Association of South-East Asian Nations (ASEAN), South Pacific Forum Secretariat and ESCAP on common issues of infrastructure development. This cooperation

provides a good opportunity to combine the ability of ESCAP to address the development process inter-sectorally with the in-built ability of the groupings to integrate development plans and programmes effectively of member states at subregional and national levels.

At the subregional level, it is worth noting the importance given to the sharing of experience in human resources development in railway transport by the ASEAN Railways General Managers' Conferences, which also regularly considers issues relating to cooperation among ASEAN countries to avoid duplication and reap maximum benefits in this area. Such initiatives of ASEAN may be of interest to other subregional bodies/associations, such as SAARC and ECO. This approach or mechanism could also be considered by organizations in other infrastructure subsectors.

One of the successful examples of human resources development in the power sector is the cooperation arrangement entered into between the Power Development Board of Bangladesh (BPDB) and the two electric power utilities in Thailand - Electricity Generating Authority of Thailand (EGAT) and the Metropolitan Electricity Authority (MEA) - under the Asian Development Bank loan "Power System Rehabilitation and Expansion Project", implemented from 1982 to 1989.

The Memorandum of Understanding for this cooperation provided for EGAT and MEA to receive designated personnel of BPDB for observation, training and orientation in the areas of:

- (a) System planning and system studies;
- (b) Financial planning;
- (c) Operation and maintenance of thermal plants;
- (d) Load despatching arrangements/ SCADA systems;
- (e) Hot line training;
- (f) Computer applications and sharing of programs;
- (g) Relay and protection arrangements;
- (h) Meter testing, calibration and replacement;
- (i) System loss reduction in the distribution system;
- (j) Commercial operations such as meter reading, billing, collection, punitive actions against fraud.

It also provided for EGAT and MEA to send some of their senior officials to Bangladesh to assist BPDB in organizing new activities, improving methods and procedures and sharing their knowledge and experience with BPDB officials.

In the project completion report ADB noted that:

"The cooperation agreement between BPDB and the Thai utilities was considered very successful by all parties concerned. It seems that such arrangements provide better results than is usually the case if a team of 'normal' consultants is engaged. To have staff of a power utility receive hands-on training in a neighboring country seems to work very well, probably because of the similarity of the operational problems that occur",

and recommended that:

"Such cooperation should, therefore, be pursued as often as possible".

In view of the lack of reliable and updated information on training opportunities and facilities available for railway staff in the region, the ESCAP secretariat developed and published in 1989 the "ESCAP Guide to Railway Training".¹ Moreover, to address the growing need for international training as a result of the new developments in railway technology, the secretariat also compiled and published the "ESCAP Directory of Railway Training Institutions"² in 1993. The publication provides detailed information on staff development training programmes suitable for international participation in ESCAP member countries as well as those offered by international organizations. It is expected that the directory as well as the "ESCAP Guide to Railway Research",³ also published in 1993 will enhance regional cooperation, including technical cooperation among developing countries.

The major recommendations for human resources development of railways in the developing countries of the region can be as follows:

- (a) Human resources development (HRD) departments may be established in all railways (if this has not yet been done),

with direct reporting to the highest railway authority in order to develop and utilize the organization's personnel. Such departments should deal with human resources planning, career development and organizational development. It should also be involved in the formulation and any revision of a railway's development plans;

- (b) The existing training curricula, materials and aids could be revised and a systems approach adopted for training development in railway administrations. Innovative training methods should be complementary to structured on-the-job training, action learning, self-development packages and coaching. Group training activities, seminars and workshops for course developers need to be organized. Inter-country exchange visits for technical cooperation among developing countries (TCDC) could be promoted to gain from the experiences of other countries in the region;
- (c) Subregional bodies/associations such as SAARC and ECO may benefit from the ASEAN experience in planning and implementing programmes for the development of human resources in railways at the subregional level.

The human resources problems facing the railways as indicated above, are also applicable to other infrastructure subsectors. To rectify these problems in the roads subsector the ESCAP secretariat completed, in 1991, an ESCAP/UNDP project on the development of rural road infrastructure in cooperation with the Central Road Research Institute (CRRI), New Delhi, India, and the Institute of Road Engineering (IRE), Bandung, Indonesia. A major objective of the project was to assist in the development of national human resources in the road sector through skills training and by promoting cooperation among developing countries of the region.

The basic activities in the project were regional training courses and national follow-up workshops. Altogether, 124 national experts from 19 developing countries in the ESCAP region were trained in different areas of roads and road transport, and a total of 374 road engineers and technicians were trained at the national level in the development of road standards.

¹ ESCAP, *Guide to Railway Training* (ST/ESCAP/757).

² ESCAP *Directory of Railway Training Institutions* (ST/ESCAP/1297).

³ ESCAP *Guide to Railway Research* (ST/ESCAP/1280).

The above activities enhanced the national capacities of participating countries to carry out rural transport surveys as well as to formulate policies and initiate relevant projects for rural transport development. The road specialists identified from leading road research institutes indicated their interest and willingness to render services (when required) to other national road authorities on a TCDC basis. Moreover, the research and development capacity of the institutes involved, namely Central Road Research Institute (India), Institute of Road Engineering (Indonesia) and Road Research Laboratory (Bangladesh) has been strengthened. Other interested developing countries in the region could also benefit from the research and development experiences of these institutes within the TCDC framework. Mongolia, for example, following the ESCAP training course, developed national standards for rural roads to improve the rural transport system in the country. ESCAP also published in 1993 "An Institutional Guide to Roads and Road Transport"⁴ as a part of its continued effort to promote cooperation among ESCAP members and associate members.

In the maritime sector, the secretariat has assisted in the establishment of maritime education and training institutions at the subregional levels at Bangkok for South-East Asian countries and at Colombo for the South Asian countries, in addition to the establishment of two national centres in China (Shanghai) and India (New Delhi) respectively, during the period 1987-91. The primary purpose of the project was to strengthen the institutional capability to carry out training tasks in the maritime field.

The Indian Institute of Foreign Trade in New Delhi launched its first three-month (part-time) Certificate Course on Shipping and Documentation for Foreign Trade Managers in early 1993. This course provided systematic knowledge to business executives and upgraded their managerial skills in trade related aspects of international shipping and multimodal transport. In the light of the success of this course, the Institute has decided to offer it on a regular basis.

B. REGIONAL POLICY AND REGULATORY ENVIRONMENT DEVELOPMENT

Trade has been the driving force behind the impressive growth performance of a number of

⁴ ESCAP, *An Institutional Guide to Roads and Road Transport* (ST/ESCAP/1326).

countries in the region. The development of regional and subregional policies for land transport provides the opportunity for countries of the region to take advantage of this force. There are eleven land-locked countries in the ESCAP region which rely mainly on the land transport infrastructure of other countries to carry their international trade, namely Afghanistan, Azerbaijan, Bhutan, Kazakhstan, Kyrgyzstan, Lao People's Democratic Republic, Mongolia, Nepal, Tajikistan, Turkmenistan and Uzbekistan. In view of the fact that the land-locked countries of the region include some least developed countries and disadvantaged economies in transition, the development of these linkages assumes even greater importance.

For many years regional cooperation in the development of land transport infrastructure in Asia has been promoted through the Asian Highway and Trans-Asian Railway projects.

The Asian Highway Project was initiated by the Commission in 1959 to: promote international road transport; stimulate economic development; and facilitate cultural exchanges among the people of the region. Although some progress has been made, for example, minimum Asian Highway standards have been developed and priority routes identified, the project encountered major development problems, which included: (a) resource limitations necessitated priorities being set for a step-by-step development; (b) several gaps remained in the network; (c) the minimum standards have not been reviewed to meet increasing traffic demands; and (d) traffic facilitation measures have not been introduced.

The Trans-Asian Railway project was initiated by ESCAP in the 1960s to assist in providing a basic rail link between Singapore and Istanbul. In 1976, the Asian Railway Master Plan was initiated with the aim of forming a coherent system of Asian railway trunk lines able to satisfy the transport requirements likely to arise by the decade 1990-2000 and beyond. Because of the close linkages between the above two projects they have been carried out on a common basis. Again, this project has encountered a number of major development problems, which included: (a) several gaps in the network; (b) different railway gauges in use; (c) no agreed line standards/requirements; and (d) no traffic facilitation measures.

However, there are several major development problems common to the both projects: (a) as each

project was designed and implemented independently, no integrated approach was considered for rail-cum-road development; (b) traffic facilitation measures (with some exceptions for road transport) were not properly considered; (c) insufficient involvement of such subregional groupings as ASEAN, ECO, SAARC; (d) lack of detailed information; (e) lack of funding; and (f) lack of proper mechanisms for coordination, monitoring and implementation.

The Asian Highway and Trans-Asian Railway routes were envisaged from South-East Asian countries to Europe via South Asia and the Islamic Republic of Iran, but as Myanmar did not become a party to either of the projects until 1989, it was not possible to connect the road and rail networks between Bangladesh and Thailand (via Myanmar). Since the mid-1970s, therefore, the projects have been held over.

Yet dynamic economic, international trade and tourism development in the region since the 1980s, as well as certain positive changes in the political climate in recent years and the advent of container technology have resulted in a new and keen interest in the improvement and development of intraregional and interregional land transport linkages in Asia, thus constituting an important and promising area for regional cooperation.

Consequently the Commission at its forty-eight session in 1992 endorsed the integrated project on Asian land transport infrastructure development (ALTID), comprising the Asian Highway and the Trans-Asian Railway projects, and the facilitation of land transport as a priority item for phase II (1992-1994) of the Transport and Communications Decade for Asia and the Pacific.⁵ A map of the Trans-Asian Railway as a part of ALTID is attached (figure 5.1). It is also important to note that the ALTID project in addition to the southern routes in the corridor Europe - South Asia - South-East Asia includes the northern routes linking Europe and North-East Asia via the ECO region and/or the Russian Federation and that both the southern and northern routes when developed with the rail-cum-road approach, could provide a developing country in Asia with: (a) land transport (rail-cum-road) links to Europe and at least one sea port in the region; (b) land transport or a land-cum-sea link to any other country in Asia; and (c) an economic choice

of at least two routes to Europe (land and land-cum-sea routes).

However, to assist in the development of intraregional and interregional land transport linkages in Asia through the ALTID project, regional cooperation is required in:

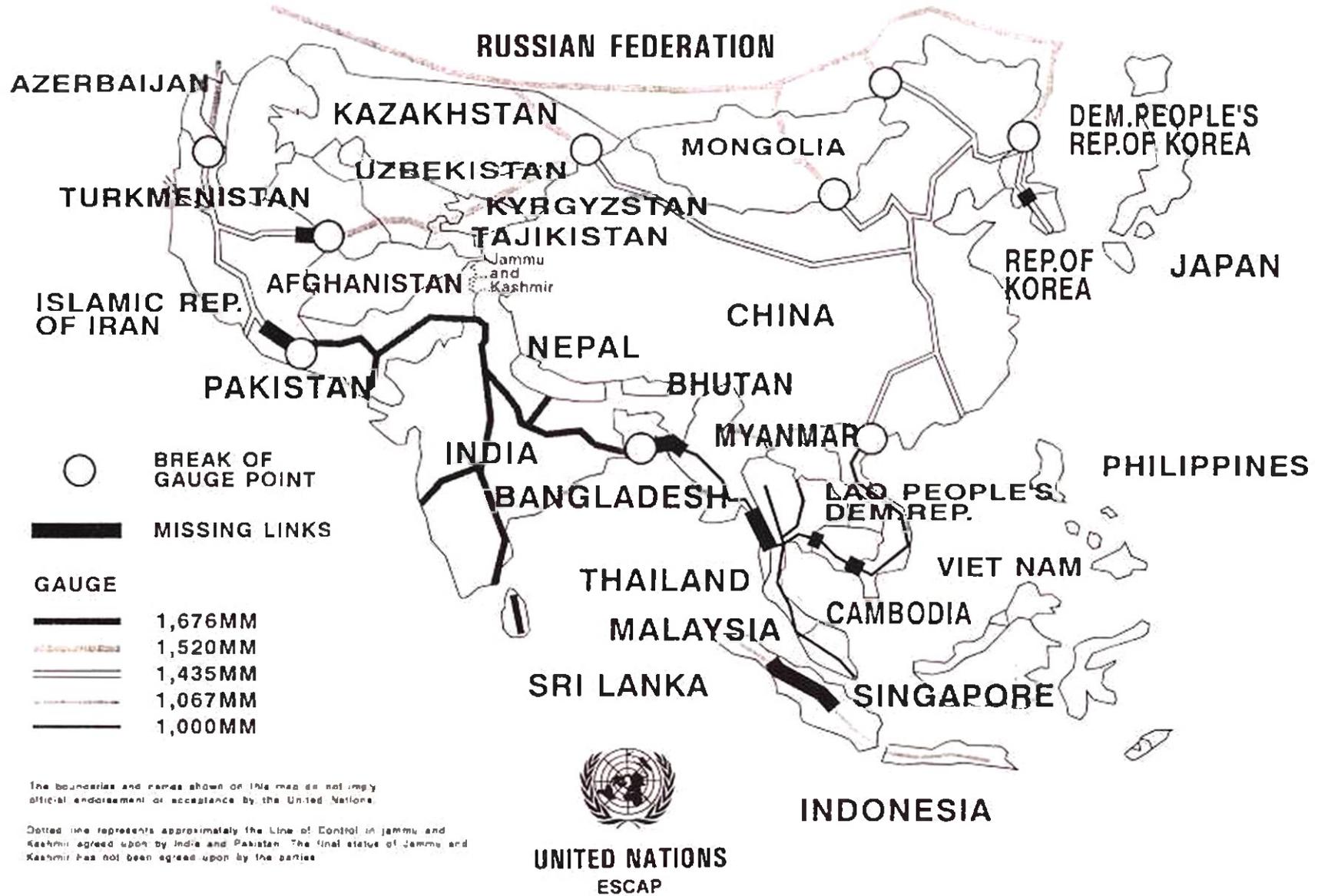
- (a) Establishing a policy regarding the routes;
- (b) Establishing minimum route standards/requirements which includes the revision of the Asian Highway standards developed in 1974;
- (c) Promoting border-crossing facilitation measures;
- (d) Introducing multimodal transport;
- (e) Cooperating with other concerned international organizations.

In view of the scope of the ALTID project its implementation strategy, as endorsed by the first session of the Committee on Transport and Communications (13-17 December 1993), focuses on the most promising areas, with the aim of maximizing the utilization of existing land transport infrastructure, establishing efficient cooperative arrangements at the subregional level, and optimizing the utilization of the limited resources available. The strategy comprises the following components:

- (a) Facilitation of land transport at border crossings through the promotion of the relevant international conventions and agreements in the region, as an important basis for the development of international trade and tourism;
- (b) Major emphasis on project implementation at the subregional level;
- (c) A step-by-step approach, through studies of corridors and other aspects of land transport development, to assist in the formulation of the rail and road network and to establish minimum route (road and rail) standards and requirements;
- (d) Cooperation with other international organizations, particularly with the Economic Commission for Europe (ECE), to avoid the duplication of work and to ensure the eventual compatibility of road and rail standards and requirements in Asia and Europe.

⁵ ESCAP, *Report of the Economic and Social Commission for Asia and the Pacific on its forty-eighth session (Official Records of the Economic and Social Council, 1992, Supplement No. 11) (E/1992/31-E/ESCAP/889)*, para. 599.

Figure 5.1 Trans-Asian Railway



Regarding cooperation between ESCAP and other international organizations concerned, the Committee on Transport and Communications noted with satisfaction the initiatives taken in promoting cooperation with the Economic Commission for Europe (ECE), European Union, the Global Infrastructure Fund, the World Development Council, the Committee of the Organization for Cooperation between Railways, ADB, European Bank for Reconstruction and Development and the World Bank. It felt, however, that the initiatives should be further promoted through other organizations, including the Islamic Development Bank. The ESCAP input to the outline plan for the development of transport sector in the ECO region (particularly in relation to ECO road and railway networks) adopted by the Transport Ministers of the ECO member countries on 25-27 October 1993 in Almaty, Kazakhstan is a further example of cooperation.

In regard to the road, rail and road-cum-rail routes concerned, it was endorsed by the Committee on Transport and Communications that existing and potential trade flows should be the main criteria which could include, where appropriate: (a) capital-to-capital links (for international transport); (b) connections to main industrial and agricultural centres (links to important origin and destination points); (c) connections to major sea and river ports (integration of land and water transport networks); and (d) connections to major inland container terminal and depots (integration of rail and road networks). The basic principle, however, should be to minimize the number of railway lines and roads to be included in the networks and make the maximum possible use of the existing infrastructure.

In emphasizing project implementation at the subregional level, the Committee on Transport and Communications endorsed the revised subregional groupings (table 5.1) as well as the action plan for the implementation of the ALTID project in 1994-1995. The action plan includes:

- (a) Implementation of ESCAP Resolution 48/11 "Road and rail transport modes in relation to facilitation measures";
- (b) Completion of the on-going study on the Asian Highway network development in early 1994;
- (c) Study on developing land transport linkages between newly independent states of Central Asia with neighbouring countries;

- (d) Project on Trans-Asian Railway in Indo-China and ASEAN subregion;
- (e) Feasibility study on connecting the rail network of China, Mongolia, Kazakhstan, the Russian Federation and the Korean peninsula;
- (f) Study on the development of the highway network in the Central Asian republics;
- (g) Study on land transport corridors between central Asia and Europe;
- (h) Ad hoc expert group meeting on the Trans-Asian Railway routes requirements.

The action plan also includes several publications, such as: Asian Highway development; land transport linkages in the newly independent states of Central Asia; railway break-of-gauge problems; Asian Highway route map (revision); transport planning development for land-locked countries (transit and border-crossing issues).

Regarding the identification of routes and the formulation of a network of the Trans-Asian Railway as a part of the ALTID project, activities have been initiated in the corridor study linking the Korean peninsula and Europe via the ECO region and/or the Russian Federation as well as in the ASEAN and Indo-China regions. As far as the Asian Highway project is concerned, a comprehensive study on network development was carried out by the secretariat in 1992-1993 with the financial assistance of Japan and the major fundings of the study including the new Asian Highway network, new Asian Highway standards and measures for facilitation of international road transport were considered by the expert group meeting held on 29 November-3 December 1993 at Bangkok with the active participation of experts from Bangladesh, Cambodia, China, India, Indonesia, Islamic Republic of Iran, Lao People's Democratic Republic, Malaysia, Mongolia, Myanmar, Nepal, Pakistan, Sri Lanka, Thailand and Viet Nam.

The development of infrastructure between countries will only prove effective and workable if it occurs within a reciprocal, complementary and consistent regulatory environment. For example, there is a range of international conventions in the field of land transport facilitation which can provide the basis for a common and mutually beneficial regulatory environment. Table 5.2 shows these conventions as reflected in the Commission resolution 48/11 of 23 April 1992 on road and rail

transport modes in relation to facilitation measures and the extent to which they have been acceded to by ESCAP members. It would be desirable for countries seeking joint land infrastructure development either to accede to these conventions or develop an agreed position on the issues they represent.

C. JOINT DEVELOPMENT

The Chukha Hydro Power Plant (4 x 84 megawatt (MW)) in Bhutan was developed with financial and technical assistance from the Government of India. The agreement between the two countries provides

for the development of the power system in Bhutan and the sale of the surplus power to India. In 1990, the Chukha Plant generated 1,541 gigawatt hour (GWh), of which 1,396 GWh or more than 90 per cent was exported. In the central and eastern zones of the country, power is imported from India.

Similarly, in Lao People's Democratic Republic around 80 per cent of the electricity generated at the 150 MW Nam Ngum hydroelectric power station has been exported to Thailand since 1971. It is also of interest to note that the provinces of Savannakhet and Khammouane are supplied from the Thai grid. The Government of the Lao People's

Table 5.1 Revised subregional groupings

<i>Groupings</i>	<i>Remarks</i>
1. Afghanistan, Azerbaijan, China, India, Kazakhstan, Kyrgyzstan, Islamic Republic of Iran, Pakistan, Russian Federation, Tajikistan, Turkmenistan, Uzbekistan, and Turkey (non-ESCAP member)	(a) ECO member countries as the basis of the grouping (b) The Quetta plan of action for ECO countries (1993) emphasizes the priority development of transport and communications in the ECO subregion; Outline Plan for the Development of Transport Sector in the ECO region was adopted by the Transport Ministers of the ECO member countries on 25-27 October 1993 in Almaty, Kazakhstan (c) ESCAP/ECO memorandum of understanding indicates transport and communications are an important area of cooperation (d) China, India, Russian Federation to ensure necessary links with neighbouring subregions/countries
2. China, Mongolia, Kazakhstan, Democratic People's Republic of Korea, Republic of Korea, Russian Federation	(a) On the basis of the recommendation of the Meeting of Ministers Responsible for Transport and Communications (3-5 June 1992) regarding the northern routes of ALTID project
3. Bangladesh, Bhutan, India, Nepal, Pakistan, Sri Lanka, Myanmar	(a) SAARC member countries as a basis of the grouping (b) ESCAP/SAARC cooperation in the development of transport linkages in the SAARC subregion of regional/international importance (c) Myanmar and Pakistan also to provide necessary links with the Indo-China/ASEAN and ECO subregions respectively
4. Brunei Darussalam, Myanmar, Thailand, Malaysia, Singapore, Indonesia, Philippines, Cambodia, Lao People's Democratic Republic, Viet Nam, China	(a) Indo-China and ASEAN subregion (b) Includes a subgroup comprising Lao People's Democratic Republic, Myanmar, Thailand, and Yunnan Province of China (c) China also to ensure necessary links with the neighbouring subregions/countries (d) Includes a subgroup comprising Cambodia, China, Lao People's Democratic Republic, Myanmar, Thailand and Viet Nam

Note:	ALTID	-	Asian land transport infrastructure development project
	ASEAN	-	Association of South-East Asian Nations
	ECO	-	Economic Cooperation Organization
	SAARC	-	South Asian Association for Regional Cooperation

Table 5.2 Accession to international conventions reflected in the ESCAP resolution 48/11 on road and rail transport modes in relation to facilitation measures of countries and areas in the ESCAP region, as of July 1993

Country or area	Convention on Road Traffic (1968)	Convention on Road Signs and Signals (1968)	Customs Convention on the International Transport of Goods under Cover of TIR Carnets (1975)	Customs Convention on the Temporary Importation of Commercial Road Vehicles (1956)	Customs Convention on Containers (1972)	International Convention on the Harmonization of Frontier Control of Goods (1982)	Convention on the Contract for the International Carriage of Goods by Road (CMR) (1956)
Group I¹							
Afghanistan				x	x		
Azerbaijan							
Bangladesh							
Bhutan							
Cambodia				x			
China					x		
Democratic People's Republic of Korea							
Hong Kong				x			
India		x					
Islamic Republic of Iran	x	x	x				
Kazakhstan							
Kyrgyzstan							
Lao People's Democratic Republic							
Malaysia							
Mongolia							
Myanmar							
Nepal							
Pakistan	x	x					
Republic of Korea	x	x	x		x		
Singapore				x			
Tajikistan							
Thailand	x	x					
Turkmenistan	x	x					
Uzbekistan							
Viet Nam							
Group II²							
Brunei Darussalam						NA	NA
Indonesia	x	x	x		x	NA	NA
Japan						NA	NA
Maldives						NA	NA
Philippines	x	x				NA	NA
Sri Lanka						NA	NA

Note: ¹ Group I – Mainland Asia.

² Group II – 'Island' countries in Asia. NA – Not applicable.

The Russian Federation, which is outside the geographical scope of the Commission, is a party to all the conventions except the Customs Convention on the Temporary Importation of Commercial Road Vehicles (1956).

Democratic Republic has plans for the development of seven large scale hydropower projects with a combined installed capacity of 2,690 MW. In June 1993, a memorandum of understanding was signed with Thailand to import up to 1,500 MW. Although the Electricity Generating Authority of Thailand (EGAT) will be the buyer of the additional power, the Government of Thailand is promoting the Thai private sector to take part in the projects.

For both Bhutan and the Lao People's Democratic Republic the power sector is one of the main sources of government revenue through exports and domestic sales. The power sector is also seen as being one of the keys to the development of the manufacturing sector. It is also clear that without bilateral cooperation none of the projects would be feasible and that the cooperation has facilitated the financing of the projects.

Part 2 of the 1992 *Survey* concluded that "in an overall assessment of the prevailing trade and investment links in the region, although considerable advances have been made in setting up formal arrangements for cooperation, the evidence seems to suggest that it is the autonomous forces of trade and investment that have been more crucial in building the regional and subregional links that are operationally active in Asia and the Pacific".⁶ This observation can also be made of the development of some of the major 'hub' ports in the region. Singapore, for example, is a major container transshipment port for the ports of Indonesia, Malaysia and Thailand and handles significant volumes of transshipment containers of other ESCAP member countries. The autonomous forces which have contributed to these regional links include insufficient cargo volumes at ports to attract mainline ships, physical port constraints and low cargo handling productivity at ports. Although these autonomous forces are dynamic (cargo volumes from the ports of a number of countries of the region are approaching levels where direct mainline calls can be sustained and new port investments have reduced physical constraints), regional cooperation in the provision of port facilities can lead to resource savings.

Currently, the area of regional cooperation being most actively studied is the 'growth triangle, quadrilateral, hexagon and corridor'. The four currently recognized 'triangles' are: (a) South China (Guangdong and Fujien Provinces – Hong Kong – Taiwan Province of China); (b) Riau

(Indonesia) – Singapore – Johor (Malaysia); (c) Tumen River Area Development (Democratic People's Republic of Korea – China – Russian Federation – Mongolia – Republic of Korea); and (d) Hat Yai (Thailand) – Penang (Malaysia) – Medan (Indonesia). Yamazawa⁷ lists an additional three subregional groups, namely 'the BAHT zone' (border area of Thailand, Lao People's Democratic Republic, Cambodia and Viet Nam), 'the Yellow Sea Economic Zone' (coastal areas facing the Yellow Sea of China, Democratic People's Republic of Korea, Republic of Korea, and Japan) and 'the Japan Sea Economic Zone' (coastal areas of China, Russian Federation, Democratic People's Republic of Korea, Republic of Korea and Japan), the last of which is at the proposal stage. Yamazawa also notes that some of these groupings are located along the borderline between market economies and socialist economies, where trade and investment has been severely restricted. However, with more open policies, trade and investment is increasing.

The Asian Development Bank is also currently undertaking a major study on 'Economic Cooperation in the Greater Mekong Subregion', which includes Cambodia, Lao People's Democratic Republic, Myanmar, Thailand, and Yunnan Province of China.

In one or two of these cases the infrastructure on one side of the 'triangle' is relatively well-developed. However, in most cases it is inadequate or non-existent. Consequently, infrastructure development is the single most important factor in the creation of a favourable environment for the development of a growth triangle. For some forms of infrastructure it may be relatively easy to assess financial and economic costs and benefits and consequently to apportion them to the members of the grouping, for example, the supply of hydroelectric power from Lao People's Democratic Republic to Thailand. For other forms of infrastructure, particularly transport, the uncertainties associated with the demand forecasts make it extremely difficult to assess costs and benefits, and consequently to apportion to the members of the grouping.

Since a 'growth triangle' concept is a subset of the regional cooperation concept its objectives are similar to those of regional cooperation. The main objective was stated in the 1992 *Survey* as being an increase in the rate of growth of output of members by:

⁶ ESCAP, *Economic and Social Survey of Asia and the Pacific 1992* (ST/ESCAP/1243/Part II), p. 35.

⁷ Yamazawa, Ipppei, 'On Pacific Economic Integration', *The Economic Journal*, 102 (November 1992), 1519-1529.

- (a) Enhancing the flexibility of domestic production through skill development, technology transfer, greater flows of capital and scarce inputs;
- (b) Increasing efficiency by relocating production and encouraging competition within the subregion;
- (c) Exploiting economies of scale;
- (d) Improving the terms of trade with the rest of the world.

However, in a recent paper from the Asian Development Bank⁸ it is noted that "Existing studies on growth triangles are mostly descriptive and do not usually discuss in significant detail the net benefits that could be derived from them". The paper notes further that this is a serious shortcoming for three reasons:

- (a) Without a proper assessment of the major costs and benefits involved, the use of resources cannot be optimized;
- (b) A clear understanding of the costs and benefits and how they 'should' be apportioned among members of the grouping is necessary if conflict is to be avoided, or at the very least, minimized and the triangle is to be sustainable;
- (c) Knowledge of the costs and benefits is needed for a realistic assessment of the capabilities and limitations of the growth triangle concept.

The economic rationale for developing 'growth triangles' is attractive and, given the extended period of inward-looking policies which the region has experienced, the prospects which they offer for improving international relations and harmony are exciting. However, careful steps need to be taken to reap the benefits of such a concept.

⁸ ESCAP, *Economic and Social Survey of Asia and the Pacific 1992*, op. cit. p. 26.

⁹ Min Tang and Myo Thant, *Growth Triangles: Conceptual Issues and Operational Problems*, Economics and Development Resource Center, Asian Development Bank (June 1993).

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Chapter VI

ISSUES AND RECOMMENDATIONS

It is estimated that between now and the year 2000, around \$1,400 billion will be required for infrastructure development in the developing countries of the ESCAP region. Of this total, \$500 billion has been identified as available or already committed. The financial gap, therefore, amounts to around \$900 billion. This is most likely an understatement as, for example, detailed estimates for rehabilitation work have not been included. These estimates of the resources required include some allowance for increases in efficiency. However, the study has also shown that there is considerable scope for further improvement in productivity. It is unlikely that sufficient funds will be found to close the infrastructure investment gap and consequently complementary measures in the area of improving efficiency will need to be adopted in order to minimize the gap. Such an approach will also help create an improved climate for investment, cost recovery and increase investment returns generating funds for re-investment.

A. ISSUES

The preceding chapters of this study and part two of the 1990 *Survey "Infrastructure Development in the Developing ESCAP Region: Needs, Issues and Policy Options"*,¹ have raised a number of policy issues which require the attention of Governments. Included on such an agenda are issues relating to the improvement of the planning process, the allocation of funds to the infrastructure subsectors, the reform of the administration of infrastructure facilities, a deepening and widening of the tax base, improvement in the design of fiscal instruments, improved information bases, coordination amongst different agencies/ministries, the environmental aspects of all infrastructure development and operation, innovative fiscal instruments, the strengthening of financial institutions and the provision of adequate legislative instruments along with the creation of a favourable macroeconomic environment for private sector participation.

¹ ESCAP, *Economic and Social Survey of Asia and the Pacific 1990* (ST/ESCAP/949:Part II)

Information

The quality of information concerning existing infrastructure, its condition and availability, the efficiency with which it is used, the underlying demand and the cost of its provision varies widely across countries. There are many cases in which there is insufficient information to make important resource allocation decisions.

Administration

The means by which infrastructure subsectors are administered is widely regarded as a major impediment to the efficient provision and operation of these services and facilities. Typical obstacles include regulation of prices, controls on maintenance and investment decisions, inability to retain profits, responsibility for the provision of various welfare services and facilities, lack of public sector funds for investment and an inability to attract or retain qualified staff.

Coordination

Within many infrastructure subsectors there is a lack of coordination between the various ministries and departments involved in the decision-making process. This slows down the implementation of infrastructure development, such as the integrated development of all modes of transport in a country. The problem is compounded when coordination is required with other ministries and departments outside the subsector. For example, transportation planning and land-use planning, particularly in urban development, should be part of an integrated process; in many instances, this is not the case. Consequently, policies which address these questions of 'internal' and 'external' coordination need to be considered and implemented.

Pricing

The regulation of prices almost invariably means that they are lower than the cost of providing the services and facilities. In addition, there is a considerable time-lag between an application for a price increase and permission being granted. This underpricing of infrastructure facilities has two main effects: first, resources are used inefficiently, and second, there are insufficient funds for the self-

financing of the infrastructure subsectors; in fact, some infrastructure subsectors have been a major drain on public sector funds. For further information on the issue of pricing please see annex I.

Operating efficiency

Some of the public sector losses could be reduced with more efficient management and operation of the facilities. Although a number of initiatives have been taken in developing corporate planning approaches to management and, in some subsectors, implementing management information systems, on the whole management procedures are outdated and in urgent need of major upgrading. Without such performance-oriented procedures, it is difficult for management to identify the areas within the organization in which major losses are occurring and the causes of low productivity levels.

Cross-country and sensitivity analyses show that significant improvements can be made in the operating efficiency of infrastructure facilities, thereby significantly reducing the infrastructure financing requirement.

Maintenance

Maintenance is another area which has been seriously neglected in the infrastructure subsectors. There is an important trade-off between capital and maintenance expenditure; significant savings can be made in overall expenditure through adequate allocations to and effective management of maintenance activities.

One of the causes of low productivity and inattention to maintenance is that the planning system in most countries is oriented toward capital formation at the expense of production management. Consequently, greater emphasis should be placed on post-implementation, operation and maintenance.

Planning

As inadequate funds to close the infrastructure gap are not available attention must be focused on the planning agencies' role in setting priorities for national development. The inadequate provision of infrastructure facilities in some countries of the region strongly suggests that reviews of the planning process are required. Increased attention also needs to be paid to integrated planning within the infrastructure subsectors, particularly the

transport subsector, as well as to the possibility of the adoption of the stage-by-stage development of infrastructure to meet the increasing demand in a flexible and cost-effective manner.

Public sector financing

The financing of infrastructure development has been primarily in the domain of the public sector. The magnitude of the financing task, coupled with various institutional and policy considerations, dictates that a substantial proportion of this finance will continue to be derived from the public sector. The principal sources of these funds are domestic resources and self-financing.

Analysis of the fiscal regimes in countries of the region indicates that there is still appreciable room for increasing government revenue through widening and deepening the tax base. At the same time, fiscal instruments can be better designed and innovations, such as value added taxation, can be more widely introduced. The issue of importance to the infrastructure sector relates again to the allocation of increased revenue to the sector.

Private sector participation

Private sector participation is a partial solution to some of the problems arising in the infrastructure sector, for example, through the provision of funds outside the government budget, the implementation of changes to improve efficiency and the transfer of technology and management. However, a prerequisite for such participation is a favourable investment climate. This environment is composed of many elements, including the legal framework for private sector involvement, trade facilitation measures, macroeconomic stability, especially in relation to prices and exchange rates, and the financing of costs and arrangements. In inviting private sector participation, Governments will be required to address these elements.

From an administrative and legal point of view, the process of involving the private sector is complex. For example, the principle of a build-operate-transfer (BOT) contract is one of risk-sharing, and as such there are a large number of agreements to be made between the principal project company and the responsible government agency, contractors, insurers, operators, lenders, trustee banks and shareholders. These contracts have to be carefully drawn up and implemented in order to

ensure that the proposed activities are feasible and in the public interest. Some countries of the region already have experience in these aspects of private sector participation.

Facilitation and regulation of private sector participation

In a number of countries, private sector participation, especially in the form of BOT, is viewed as the answer to infrastructure development. However, long lists of projects with a comment "suitable for BOT" are not generating the desired response. In this respect, consideration needs to be given to the preparation of project proposals from the perspective of the information needs of potential private sector investors.

The experience of privatization outside the region suggests that for the infrastructure sector, public monopolies have simply been replaced by private monopolies. As a result, the role of government has changed from active participant to facilitator and regulator of the area of involvement of the private sector. This has been the experience of privatization in, for example, the United Kingdom of Great Britain and Northern Ireland where public monopolies have been replaced by a private sector controlled by regulatory authorities.

Equity and efficiency

The practice of using the infrastructure subsectors as instruments of general socio-economic policy has confused the questions of efficiency and equity. A minimum requirement of any management information system established within an infrastructure subsector is that the cost of meeting such obligations be clearly identified.

If it is decided to introduce pricing reforms and to improve productivity, careful consideration needs to be given at the policy formulation stage to the impact on the members of society directly affected by such reforms.

Poverty alleviation

The structural changes associated with economic development place considerable pressure on specific groups within the community and the impact tends to vary widely from region to region. In the long-term, human resources development is a key to redressing many of these inequalities. In the short term, however, policies need to be adopted which will mitigate the impact of the

changes and facilitate sustainable economic development. In this respect the development of infrastructure has a role to play in, for example, increasing the contribution of women to sustainable economic development, reducing farm-to-market transport costs, providing the basic facilities required to reduce the regional concentration of industrial development, and in providing easier access to education, health services and employment opportunities.

Environment

The development and operation of infrastructure facilities can have a major impact on the environment. There is a spectrum of policies which can be adopted by Governments ranging from unconstrained freedom to exploit the environment to a total ban on the offending activity. In the face of the evidence, both ends of the spectrum are untenable. The policy issue for consideration is the choice of means to reduce to acceptable levels the adverse environmental impacts of infrastructure development. For further details on the issue of sustainability and environmental aspects see annex II.

Least developed, land-locked and developing island countries and the disadvantaged economies in transition

To date, expenditure on infrastructure in many least developed, land-locked and developing island countries has almost wholly been underwritten by substantial inflows of official development assistance (ODA). Given the recurrent requirement for such assistance, there is a real danger of donor lethargy. In this respect, there is an urgent need for recipient countries to develop long-term strategies which clearly demonstrate the path which the country is following towards sustainable development. In countries which have emerged from civil war, much of the infrastructure has been damaged or destroyed. In Cambodia, for example, some of the needs are so fundamental that the World Bank's "Agenda for Rehabilitation and Reconstruction" included such basic recommendations as regular payment of salaries and the provision of essential spare parts, materials and fuel.² In the disadvantaged economies in transition infrastructure has been inadequately maintained and consequently an important issue is rehabilitation. In the transport sector an important issue for the Central Asian republics is the

² World Bank, *Cambodia: Agenda for Rehabilitation and Reconstruction* (June 1992).

Box VII. DIVERGENT INFRASTRUCTURE NEED OF ESCAP COUNTRIES

There are considerable differences in the infrastructure needs of ESCAP member countries. For countries which have emerged as major growth centres, the requirements include high capacity mass transit schemes and expressways, for countries which have the basic infrastructure but have not maintained it for some time, major rehabilitation is required, while for some least developed countries infrastructure is required to link parts of the country to the main transport, power and telecommunications networks. In countries which have emerged from a period of extended civil war the requirements are more fundamental. In Cambodia, for example, it has been estimated that the transportation infrastructure is functioning at about 40 to 50 per cent of its capacity in the 1960s; power shortages are so acute that economic activities and the provision of power dependent services are severely curtailed:

Transport. Priorities would include: (i) the provision of essential spare parts, materials, and fuel; (ii) repairs of the most dilapidated sections of the primary network including temporary structures (in particular RN5 and RN6) and key provincial roads (for example, RP69); and (iii) regular payment of salaries. Tools, spare parts, and materials are also needed urgently for civil works and rolling stock of the railways and main ferries. New cargo handling equipment together with technical assistance in management and operations must be provided for railways and ports (Phnom Penh and Kompong Som). Some navigational aids and basic communications for civil aviation are expected to be provided under UNTAC.

Power. In order to prevent the collapse of the public electricity services, immediate action must be carried out (i) to improve the utilities finances through more effective collection of user charges and the implementation of an electricity loss control programme; (ii) to acquire at least two new 2,100 kW diesel generator sets and put into operation a 3.5 MW plant left uncommissioned; (iii) to undertake critical repairs to the distribution system on a test and repair field approach; and (iv) to overhaul and replace, when justifiable, all existing generating equipment in provincial capitals.

Water and Sanitation. Immediate action must be carried out (i) to improve the utilities' finances through more effective collection of user charges and the implementation of a water loss control programme; (ii) to replace the generators to ensure continuous pumping at the Phum Prek treatment plants; (iii) to increase water supply and complement existing facilities by building and operating deep wells which would sell water in bulk and retail, and serve as a free supply for fire-fighting equipment; (iv) to undertake the detailed mapping and examination of the underground network to plan its rehabilitation and expansion; and (v) to upgrade sewage collection to minimum standards.

Telecommunications. A limited but effective domestic telecommunications system, based on a satellite network, should be made operational."

Source: The World Bank, *Cambodia: Agenda for Rehabilitation and Reconstruction*, East Asia and Pacific Region Country Department I (June 1992).

reorientation of the network so that linkages between countries of the ESCAP region can be strengthened.

Multimodal transport

The provision of infrastructure for and development of efficient transport systems is essential for the development of a country's trade. For many countries of the region, especially the land-locked countries, this requires a number of different modes

of transport, transit through third countries and border crossings. Countries need to consider integrated systems approaches to the transport of goods, multimodal transport, transit arrangements and facilitation of border crossings.

Human resources development

The key role of human resources development is clear from the above outline of the main issues associated with infrastructure development, be they

improved administration, operating efficiency, maintenance or coping with the introduction of private sector participation. In this respect, clear policies need to be developed to ensure that the full potential of human resources are realized.

Regional and subregional cooperation

Regional and subregional cooperation can play an important part in human resources development through the transfer of expertise, skills, technology and knowledge, and the exchange of experience in infrastructure planning, finance, development, management, operation and maintenance. The major issue for consideration in this area relates to the strengthening and development of mechanisms whereby the potential benefits of these transfers and exchanges can be realized.

The bilateral development of infrastructure facilities in, for example, the power sector is providing a major revenue source and has equipped a number of least developed countries with the potential to develop their manufacturing sector. Without bilateral cooperation some projects would not have been feasible. In addition, cooperation has facilitated the financing of the projects.

Trade has been the driving force behind the impressive growth performance of a number of countries in the region. The development of regional and subregional policies for land transport provides the opportunity for countries of the region to take advantage of this force. In view of the fact that the 11 land-locked countries of the region include least developed countries and disadvantaged economies in transition, the development of these linkages assumes even greater importance.

Another important and promising area of cooperation is between the subregional groupings of the Association of South-East Asian Nations (ASEAN), ECO, Forum Secretariat, South Asian Association for Regional Co-operation (SAARC) and ESCAP where the ability of ESCAP to address the development process intersectorally could be effectively combined with the ability of the groupings to integrate development plans of its member countries at subregional and national levels.

B. RECOMMENDATIONS AT THE COUNTRY LEVEL

The following recommendations have been made to focus developmental effort on addressing the major

issues in the infrastructure sector. The main responsibility for action on these will rest with the countries of the region. However, there is an important role for subregional and regional organizations in supporting initiatives and facilitating implementation through closer inter-agency cooperation. While the vast majority of recommendations apply to all countries of the region, it is recognized that there will be exceptions.

Upgrade information as a basic resource for infrastructure planning

Information and adequate, accurate data are prerequisites for the planning process, yet many countries have considerable problems in consolidating information on infrastructure facilities and future requirements in a consistent and coherent form. Infrastructure planning and construction has a long lead time which often extends beyond the duration of national five-year plans. There is a need for more information and data on available infrastructure, its condition, the underlying demand, including the consumption of products and services, and the cost of providing these to the user community.

Infrastructure information resources on current capital stock, demand for capacity and the key indicators which can be employed in quantifying critical shortfalls in infrastructure capacity should be developed. Costs, both fixed and variable, of providing services/outputs to the user community should be identified and quantified. On the basis of the improved data and information resources Governments can develop longer term, perhaps rolling, investment plans which can provide a more effective framework for the prioritization of project implementation and investment planning.

Implement demand management measures

It is evident that the products and services generated by the available and already overstretched infrastructure are being consumed inefficiently or even wasted. It is the role of Governments to implement creative approaches to enlighten and encourage the user community to make decisions which will, directly or indirectly, have a beneficial impact on the consumption of available and future output. Governments should review the application of subsidies and price-setting tools to encourage efficient usage of limited outputs and resources. Public awareness campaigns and marketing can be used as vehicles by the

Government in creating an informed community which will be more prepared to adjust consumption patterns in line with resource availability.

Reform the administration of Infrastructure facilities

The creation of an effective decision-making framework for infrastructure development and operation can significantly increase output efficiency in the infrastructure sector. Central government administrative controls and procedures should be reviewed and streamlined. Attention should be given to the interaction, and increased coordination, of infrastructure falling under the responsibilities of different ministries which may complement each other or compete for users, but certainly compete for resources. Improved land-use planning will be an important component of this activity. A more responsive framework for decision-making and the delegation of authority to competent agencies and organizations should be encouraged within a coordinated plan of action. Governments should guide and assist the various agencies and organizations to evaluate their internal administrative practices and procedures with a view to identifying areas in which more commercial management practices could be associated with appropriate levels of autonomy. Consideration should be given to the metamorphosis of government agencies, or elements thereof, through a process of corporatization (by the transfer of assets and authority to a pseudo-private organization under public control) with internal responsibilities that mirror the private sector in terms of clearly defined financial and operational objectives along with decision-making authority, thereby removing some of the administrative inefficiencies. Corporatization can be used as a stepping-stone to privatization.

Ensure existing infrastructure is capable of producing design output

A wide range of examples exist of infrastructure projects which are now in operation at "maximum output" yet which fail to achieve a production capacity that is even close to the expectations of the original design. The reasons for this include outdated management systems, inefficient operational practices and inadequate maintenance. Modern, performance-oriented management procedures should be instituted and supported by appropriate management reporting systems. They should include fully integrated quantified operational and financial objectives agreed

between the management and the controlling body. Full consideration should be given to computerization of the organization, and particularly information systems, to ensure timely reporting to support management in decision-making. Where management skills are weak or where the transfer of technology is seen to be particularly beneficial, a management contract may provide the opportunity for increased efficiency. Operational practices should be reviewed. Particular attention should be given to areas where significant investment has been made in new technology and mechanization, but where old chains of command, practices and manning levels remain and anticipated productivity gains have not materialized. Better planned, managed and financed maintenance will enhance the output of the infrastructure sector and increase the economic life of projects, reducing the costs of both product and new infrastructure demand. Adequate budgets should be provided for maintenance tasks and, where necessary, special hard currency funds should be released expeditiously. In appropriate circumstances, funds should be set aside for the modernization of existing infrastructure and facilities as a priority over new construction.

Upgrade planning, and prioritize projects

National planning agencies should be strengthened, more effective modalities institutionalized and tools provided which will establish clear and quantified guidance to assist in introducing integrated infrastructure development planning as well as in prioritizing projects and exposing the cost of politicizing investment decisions. Comprehensive information and data, in a consistent form, should be made available on all competing projects. This will provide the basis for effective prioritization of investment timing, perhaps with a distinction between projects which can be identified as being funded preferably by the public or private sectors, depending on projected economic and financial returns. Arrangements should be institutionalized which will create 'transparency' in the investment decision-making process with the aim of minimizing irregularities and abnormalities. Mechanisms may include strengthening national planning agencies to assist them in minimizing political interference in the planning process and public debate of investment plans to minimize the potential for investment leakage. Computer tools should be developed and used to assist in the planning process. Such tools can assist in the financial and economic evaluation of benefits by providing a clear and comprehensive

logical progression from projection through costs to benefits. They will also assist in the management and control of consultants by making assumptions more transparent, options more easily tested and project data updated as situations change.

Increase public sector resources for infrastructure

Attention needs to be devoted to the general question of public sector resource mobilization and the specific issues of the allocation of capital (or development) budget to the infrastructure subsectors; in addition, self-financing policies, including cost-saving measures, should be implemented. The magnitude of the infrastructure financing task, coupled with various institutional and policy considerations which demand a phased approach to implementation, largely dictate that a substantial proportion of infrastructure finance will continue to be derived from the public sector, at least in the medium term. Governments should devise financial and economic guidelines for the infrastructure subsectors. Such guidelines would adopt a general principle that prices reflect the costs of providing the subsector's services and facilities. *Inter alia*, the guidelines should include a clear definition of the costs. Where, for social or other reasons, this is deemed not to be possible, the relevant costs and consumers should be clearly identified.

Careful review is also required of the level of funds allocated to infrastructure, including the mechanism by which the funds are allocated, to ensure at least minimum investment resources are available to cover maintenance and operating costs. Governments should review the means by which domestic resources are mobilized and, where appropriate, implement measures aimed at increasing such mobilization. In the area of fiscal policy, instruments can be better designed, innovations introduced and measures taken to reduce tax evasion. In the financial markets, there is scope for introducing or expanding accessibility of financial institutions and introducing new financial instruments.

Increase private sector participation

The potential for increasing the role of the private sector in infrastructure financing, management, operations and risk-sharing should be explored so that it can make a greater contribution to national progress within the overall context of infrastructure development. Governments should identify the

areas in which the private sector can participate beneficially in infrastructure investment, management and operations. Considerations will be founded on the delineation of particular problems which private sector participation is expected to overcome and the subsequent issues that will be raised if the policy is implemented. Factors such as national interests, the level of retained control, labour reaction, projected financial return, the sharing of risks and investment burden will need to be taken into account. Governments should create a climate that will attract the private sector to participate in infrastructure investment. This will involve, but not be restricted to, providing a legislative framework that safeguards national interests while providing the opportunity for flexible, responsive decision-making and supports private ownership. Appropriate mechanisms should allow discretionary redeployment of accrued profits and benefits. Governments and agencies should provide comprehensive details of projects for potential private sector financing, including projected investment returns, both financial and economic. The availability of such information provides the basis for constructive dialogue between the public and private sector. To create additional confidence, the public sector should take action to decrease the level of risk that the private sector will have to shoulder. In particular, within a project cycle, a process of pre-qualification to a reasonable number of competent firms should be adopted, thus minimizing waste and demonstrating government commitment. Governments should consider alternative forms of private sector participation which, under given circumstances and retained level of control, will provide alternative benefits, for example, in terms of technology transfer (management contract and long-term leasing), efficiency and reduced cost (corporatization and privatization), minimizing investment and government involvement (build-operate-transfer) and recovering sunk investments (privatization and the sale of assets).

Establish a framework for appropriate equity and welfare

Governments, labour and management need to work together in resolving issues which will arise if improvements in productivity are to be attained and traditional labour markets reduced to a level which is in line with real demand. Labour should be involved as a full partner with government and management in the planning process. Given an equitable position, with appropriate safeguards and benefits, labour can play a vital role in promoting

the development of infrastructure. Government, labour and management should together identify the real employment requirements of existing and planned infrastructure. Action should be taken to provide the opportunity for labour and management to move to alternative, non-traditional employment through mechanisms such as two or more years leave of absence with the security of guaranteed re-employment, if necessary. Alternatively the provision of loans or grants to employees prepared to separate from the organization for the establishment, of small-scale enterprises may be considered. Effective social welfare schemes should be set in place which will respond to the needs of the less fortunate who may not have employment opportunities, or access to state agency schooling and hospitals.

Enhance human resources development

Effective human resources development strategies and programmes to upgrade skills should be fully integrated in the infrastructure development process. Guidelines for the integration of human resources development strategies within infrastructure development and their financing should be developed and implemented. Such guidelines should not just focus on the allocation of capital budget but encompass the continuing need for quality training and re-training to ensure needed skills are in place. Human resources development departments should be established in each of the infrastructure subsectors with direct reporting to the highest authority in order to develop and utilize the organization's personnel. These departments should deal with human resources planning, career development and organizational development. The capability and capacity of educational institutions should be enhanced and reoriented to match more effectively the requirements in the infrastructure sector. Qualified instructors should be recruited, adequate facilities and equipment provided and institutes encouraged to develop curricula and deliver relevant courses, including those designed to prepare personnel for self-employment.

Institute environmental impact assessments

Infrastructure development can have a massive and irreversibly detrimental impact on the environment. It is the responsibility of Governments and their agencies to ensure that, irrespective of the scale of infrastructure projects, the impact on the environment is minimized. Environmental impact assessment (EIA) should be mandatory for all projects in the infrastructure sector. Governments should review current environmental guidelines and standards. Adequate maintenance and improved management of existing infrastructure, which has already had an impact on the environment, should be given high priority as a means of extending economic life and minimizing the need for new building. The impact of existing infrastructure operation on the environment should be evaluated and, where appropriate, systems upgraded through the adoption of more environmentally friendly technologies.

Focus on poverty alleviation, rural areas and disadvantaged population groups

The integration, with infrastructure, of effective regional policies will provide the opportunity for improved physical access while creating a wealthier community. The development of infrastructure can be directly equated with economic development and, potentially, job creation. Governments should review regional planning policies and infrastructure sector employment potential which will create the opportunity of reducing the concentration of poverty. Special attention should be given to the development of infrastructure that will enhance the opportunity of the rural population to contribute to economic growth. Policies should be developed to encourage agencies and organizations to give serious consideration to the involvement of women and disadvantaged population groups and thereby explore alternative sources of expertise and broaden the base of the workforce.

Box VIII. GROWTH AND SPATIAL EQUITY IN WEST MALAYSIA

The growth experience of many countries in the ESCAP region has been impressive, especially when compared with economic growth in developed countries. In most countries however, the regional distribution of the benefits of this growth have been limited. A study on the Kelantan region in Malaysia draws a number of strategy recommendations for domestic regional policy.

Two alternative strategies for economic development in peripheral areas of developing countries are currently under discussion. The integration strategy, according to which an intensification of interregional linkages is crucial for regional growth, on the one hand encourages improvements in interregional infrastructure and facilitates mobility of the factors of production. The dissociation strategy, on the other hand, according to which underdevelopment in the periphery is attributed to imbalances in interregional interaction, supports spatial separation from the core area and independent regional development.

These alternative strategies have until now been the subject of mainly theoretical discussion; here they are applied to a specific case study. Since it is not feasible to evaluate all aspects of the integration and dissociation strategies, the political and social problems associated with their implementation are omitted and emphasis is placed on the analysis of the potential for industrial development. Although improvements in agricultural structure are of considerable importance for regional development, agriculture alone cannot create additional employment for the growing population. Greater importance attaches, therefore, to the promotion of complementary sectors of the economy, a process in which manufacturing industry has a vital role to play.

On the basis of the findings of this study, some fundamental strategy recommendations for the Kelantan region can be made. Interregional integration should be encouraged by developing transport and telecommunications. At the same time, enterprise-related infrastructure should be expanded within the region. It is recommended that these measures should be concentrated in a small number of industrial estates which should be located in centres possessing scope for further development.

Within the framework of industrial policy, further support should be given to the establishment of foot loose branch enterprises, since this type of enterprise positively influences regional growth. At the same time, greater assistance must be given to the development of local enterprises serving local needs which are not only less likely to move away from the region at a later date, but are also able to function as suppliers to other enterprises, thereby increasing regional linkages and their effects. The aid granted under regional policy measures to such enterprises has, so far, been inadequate. Finally, government contracts, favourable credit terms, advisory and training services for those establishing small businesses, as well as assistance with purchasing and marketing, could all contribute towards accelerating regional development in Kelantan.

Source: Institute of Southeast Asian Studies, *Growth and Spatial Equity in West Malaysia*, Ludwig H. Schätzl, ed., 1988

Special measures to address the infrastructure needs of the least developed, land-locked, and developing island countries and disadvantaged economies in transition

In the least developed, land-locked, and developing island countries and disadvantaged economies in transition, special and significant problems exist which intensify the difficulties in providing adequate and efficient infrastructure. Sometimes because of lack of investor confidence many of these countries have to rely on official development assistance

(ODA) to underwrite investment in infrastructure. The least developed, land-locked, and developing island countries and the disadvantaged economies in transition can increase the confidence of donors by ensuring that investment resources, including ODA, will be devoted to projects which directly contribute to increasing the pace of economic development. The implementation of administrative and management improvements, as set out in previous recommendations, should be of high priority in this process. Long-term strategic plans leading to sustainable economic development, with details of related national initiatives aimed at increasing efficiency, should be developed to

provide a framework for assistance. Immediate attention should be given to the maintenance and rehabilitation of existing infrastructure so that it can perform the basic functions for which it was originally designed. Where necessary, special arrangements should be put in place for the expeditious release of hard currency funds required for spare parts and materials. Policies designed to create 'development concentration zones' should be considered with the objective of attracting investment. Industrial development zones, industrial estates and export processing zones have already been successfully commissioned in the region to provide enhanced levels of infrastructure and services to appropriate investors. This approach also allows Governments to be selective in focusing investment and job-creation opportunities to benefit specific communities. The provision of improved access and transit arrangements, especially for land-locked countries, should be integrated into national infrastructure planning. Particular attention should be given to the facilities required at border crossings.

C. RECOMMENDATIONS AT THE REGIONAL LEVEL

While implementation of the recommendations at the country level is the responsibility of Governments, it can be facilitated by action at the regional level. Additionally, regional action can be cost-effective in assisting countries in achieving their development objectives in terms of satisfactory levels of infrastructure development and performance. Action in support of national initiatives may include the provision of technical assistance; the development, at regional level, of models and tools which may be applied in a number of countries at the national or project level; the production and dissemination of training materials; regional research and development, including comparative studies which could form the basis for exchanges of experience and know-how; and coordination, cooperation and facilitation of development activities which will be of growing importance as the impact of infrastructure projects increasingly transcends national boundaries. In particular, special focus on the training, information and other needs of those countries with the lowest levels of development will be required.

Specific areas where regional cooperation can play a supportive or even catalytic role in development include the following:

Information/data: To provide the basis for regional cooperation, technical cooperation among developing countries and research, it is necessary that information and data be collected on a regional basis. This can assist in the identification of similar types of projects where information exchanges may be particularly useful, for example, on technology, contract formulation and costs. In addition, details of educational and training opportunities across the region could be maintained.

Comparative studies: Countries of the region are building valuable experience in the implementation of a wide range of initiatives, including public sector reform, implementation of improved management procedures, corporatization, joint ventures, privatization and development of industrial estates, which could provide a valuable resource for the region if properly evaluated and transformed into regional guidelines.

Technical assistance: For all countries and particularly the disadvantaged, there is a need for technical assistance at all levels to support the infrastructure development process. Examples include advice on the drafting of terms of reference, project evaluation, improving management procedures and information systems, maintenance of infrastructure, procurement issues and computerization.

Development and dissemination of models and tools: Purpose-designed models, tools and software to assist Governments and agencies in undertaking their activities more efficiently can be cost-effective if developed at the regional level. Examples could include forecasting models which, taking into account competing and complementary developments across the region, could predict demand and investment requirements; financial and economic planning models designed to assist in the evaluation of investment projects; management software, for which there is general demand, such as in the area of asset maintenance and control.

Identification of regionally significant projects: The impact of many significant infrastructure projects is now transcending national boundaries. A perception of potential benefits and perspectives of the sharing of facilities, aligning routes and equitable cooperative arrangements between countries or subregions can be obtained at the regional level. Many examples exist in the railway (Trans-Asian Railway), road (Asian Highway), power, communications, water and port sectors

where regional level involvement may be essential to effective planning. Such an approach can also strengthen the opportunities for growth triangles.

Facilitation: Facilitation at border crossings can provide the opportunity to minimize delays, costs and demand for infrastructure. With the growth of trade, the development of freight forwarding and the introduction of multimodal transport, all of which have an important international ingredient, inputs at the regional level are becoming increasingly important.

Human resources development: Training materials can be developed and delivered through training-of-trainer activities, seminars and workshops as well as distributed to national institutions. Networking of training and research institutions, initiated at the regional level, can effectively complement and supplement capabilities. Action could also be taken to initiate intercountry exchanges of experts to bring practical knowledge and experience of the development process and provide on-the-job training.

Involvement of subregional organizations: Subregional organizations have an increasingly vital role to play in the infrastructure development context. They already provide a forum for consultation at the policy and technical levels, including coverage of infrastructure issues. This activity can usefully be extended to enhance further cooperation among Governments both mutually and through regional initiatives which can lead to subregional collaboration.

Meetings of chief executives: Regional meetings at the chief executive level in which discussions of topical issues should be initiated to assist in fostering a climate for closer collaboration and problem-solving through the sharing of experience. Examples of issues which would be covered in such meetings include pricing policy, technology developments, human resources development and new initiatives.

Interagency cooperation: Opportunities for increased collaboration between regional agencies, including ESCAP and ADB, should be enhanced through joint identification, and, where appropriate, the execution of studies, projects and activities. The implementation of phase II (1992-1996) of the Transport and Communications Decade for Asia and the Pacific has already demonstrated the potential benefits of closer collaboration in focusing development assistance and minimizing duplication of activities.

D. CONCLUDING COMMENTS

The development of infrastructure facilities is a necessary condition for sustainable economic growth and development. The above recommendations provide a firm basis for developing those facilities.

The recommendations need, however, to be formulated as an action plan so that their full potential can be realized. Some of the decisions which have to be made in implementing the recommendations will be difficult. However, the cost of not making the decisions will bear heavily upon the welfare of the nation. There is a need for political commitment at the highest level in order that the recommendations can be translated into positive action and the potential benefits realised.

The ending of the cold war and the return of peace to the region has provided the opportunity for regional cooperation to play a much more important role in the development of infrastructure facilities. The wealth of experience in infrastructure development, which already exists in the region, also provides a platform from which countries can learn and develop suitable approaches to the accelerated provision of infrastructure facilities.

The intensification of this cooperation will be to the mutual benefit of all countries in the ESCAP region.

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ANNEX I

DEVELOPING FINANCIAL AND ECONOMIC OBJECTIVES, INCLUDING PRICING; THE UNITED KINGDOM EXPERIENCE

The requirement that prices are related to costs raises a number of questions concerning which costs should be taken into account. Given also that financial viability may take sometime to achieve and that rationing of scarce capital resources by Governments will remain a feature of many member countries of the ESCAP region for some time, the experience of the United Kingdom of Great Britain and Northern Ireland in developing financial and economic objectives for nationalized industries has some relevance.

In 1961, 1967 and 1978, three white papers were published, each dealing with the financial and economic objectives of nationalized industries.

*The financial and economic obligations of the nationalized industries (1961)*¹

The first White Paper considers the objectives of the nationalized industries under three main headings: revenue account (financial objectives), capital account (investment and borrowing) and prices and costs (pricing).

Under the revenue account heading, it required that surpluses were at least to cover deficits over a five-year period.

When calculating costs, the following items were to be included:

1. Interest;
2. Depreciation on an historic cost basis;
3. A provision for the excess of replacement cost over historic cost on new investments;
4. A provision to meet premature obsolescence or other unforeseen contingencies.

Under the capital account heading, the Government exercised powers over the industries' investment and borrowing proposals by: reviewing their plans for the next five years annually; fixing upper limits on the level of investment to be undertaken in the following two years; and by requiring approval of proposed borrowing.

The third heading of prices and costs was concerned with impressing on the industries their responsibility to the community; recognizing some of the problems they have in setting prices; and noting that financial performance can be improved not only by increasing prices but also by increasing productivity and reducing costs.

*Nationalized industries: A review of economic and financial objectives (1967)*²

This White Paper noted that a conflict can arise between a financial objective in terms of an overall percentage return on assets, the test discount rate used for new investment and a pricing system that is related to costs at the margin. However, it also recognizes the practical necessity of objectives and obligations. In the face of this conflict, the Paper adopted a flexible approach, whereby general principles were laid down and any conflict arising could be discussed with the Government.

In setting financial objectives (or targets) the Government was to take into account "return on new investment, a soundly based pricing policy, social obligations not covered by a subsidy, efficient operation and national prices and incomes policy". Targets, which had been agreed for the various industries at the time of publishing the Paper, were in terms of income as a percentage of average net assets, income being either gross - before interest and depreciation, or net - before interest but after depreciation at historic cost. The only industry which took into account the replacement cost of assets was the National Coal Board which had the target "to break even after interest and depreciation including £10 million a year to cover the difference between depreciation at historic and replacement cost".

¹ H.M.S.O., *The Financial and Economic Obligations of the Nationalized Industries*, Cmnd 1331, 1961.

² H.M.S.O., *Nationalized Industries: A Review of Economic and Financial Objectives*, Cmnd 3437, 1967.

The Paper's discussion of investment can be conveniently divided into two parts, first, a statement of the reason for control and, second, the vehicle of control. The reason for control "is that the most efficient distribution of goods and services in the economy as a whole can be secured only if investments are made where the return to the economy is greatest" and the vehicle is the use of discounted cash flow (DCF) techniques using the Government's test discount rate (TDR), which was 8 per cent in real terms at the time of publishing the Paper. The Government's flexible approach was again demonstrated when the conditions under which a proposed project, which did not meet the 8 per cent DCF rate of return might be accepted, or which did meet the requirement but might be rejected, are discussed. In the former case, the Paper is mainly concerned with those situations where there are social costs and benefits which are not normally included in a commercial investment appraisal, but which are relevant when considering society as a whole. In the latter case it is recognised that the TDR is a long-term device for ensuring that the public and private sectors' calls on resources do not diverge markedly. However, in the short run the Government may have to take into account competing claims for scarce resources and reject projects which pass the test.

The first statement in the Paper with respect to prices draws attention to the link between sound investment appraisal and pricing policies. In keeping with the general policy of treating the industries as commercial concerns, it then adopted the criteria that not only should prices be set such that revenue covers accounting costs, but also that prices should be related to costs at the margin. While these are the broad principles, the specific aim of pricing policies "should be that the consumer should pay the true cost of providing the goods and services he consumes, in every case where these can be sensibly identified". The section on prices then went on to discuss three reasons why prices may differ from costs and suggested pricing systems which would be applicable in those cases. The first reason was where the cost of providing the goods and services to specific consumers was difficult to identify and therefore difficult to allocate to those consumers. This situation can arise where goods are produced or consumed jointly. The Paper cites the use of two-part or differential pricing systems as attempts to minimize distortions in the allocation of resources. The second reason was where there were "wider economic or social considerations" and the third reason was where excess capacity or excess demand could be minimized by charging prices different from costs.

These two phenomena can be both short and long run in nature. In the short run, it may be that there are peaks in demand, in this case, setting prices so as to encourage the utilization of facilities during the off-peak period (such that the price does not fall below the *variable* cost incurred) and discouraging utilization during the peak was suggested. In the long run, it may be that there was unused capacity, in this case, pricing down to *escapable* cost (if this increased demand) was suggested.

Thus, one could interpret the discussion on pricing as being consumers should pay the true cost, but at the same time the relevant (short- or long-run) marginal cost should be borne in mind when setting the charge.

*The nationalized industries (1978)*³

This White Paper attempted to resolve the conflict between marginal cost pricing, a test discount rate, and financial targets. The principle behind this attempt is shown in figure I.1.

The test discount rate of the 1967 White Paper was replaced by the required rate of return (RRR). This was set at 5 per cent and represented the opportunity cost of capital (broadly reflecting the pre-tax real rate of return in the private sector). The industries were expected to achieve this on *all* new investments, including those which were non-revenue earning (for example, investment in head offices, necessary replacements etc.).

An interpretation of the recommendations is that from the project proposal, the cost of providing the extra tranche of output is estimated. This cost estimate, the RRR and the expected demand are then input into an investment appraisal model which in turn outputs the supply price, the supply price representing that price which is required in order to meet the RRR.

The supply price is then compared with the prices obtained from the demand forecasts. Given that the supply price, and price and quantity obtained from the demand forecast are compatible then the project could be accepted. It is suggested that:

"In the case of industries where the outputs of old and new assets are indistinguishable, total revenue would be derived directly from the price needed to earn the RRR on new investment; where the price which can be

³ H.M.S.O., *The Nationalized Industries*, Cmnd 7131, 1978.

charged for the output of old assets is different from that which would be charged for that of new assets, it will be necessary to take account of this in deriving the total revenue figure."

This implied that in cases where the outputs were indistinguishable, price was set such that total revenue would be sufficient to replace those assets for which demand exists (that is, price provides a signal to the producer indicating which assets should be replaced).

The data obtained up to this point are then converted into a financial target in terms of a return on capital employed (ROCE). The total revenue is calculated according to the above quotation. "Costs, including depreciation, would then be deducted and the resultant net profit would be expressed as a return either on assets or some other appropriate base".

Thus, by carrying out the calculations sequentially the three objectives are interrelated.

In practice, however, the Government reserved the right to take into account "social, sectoral and wider economic considerations" when setting financial objectives.

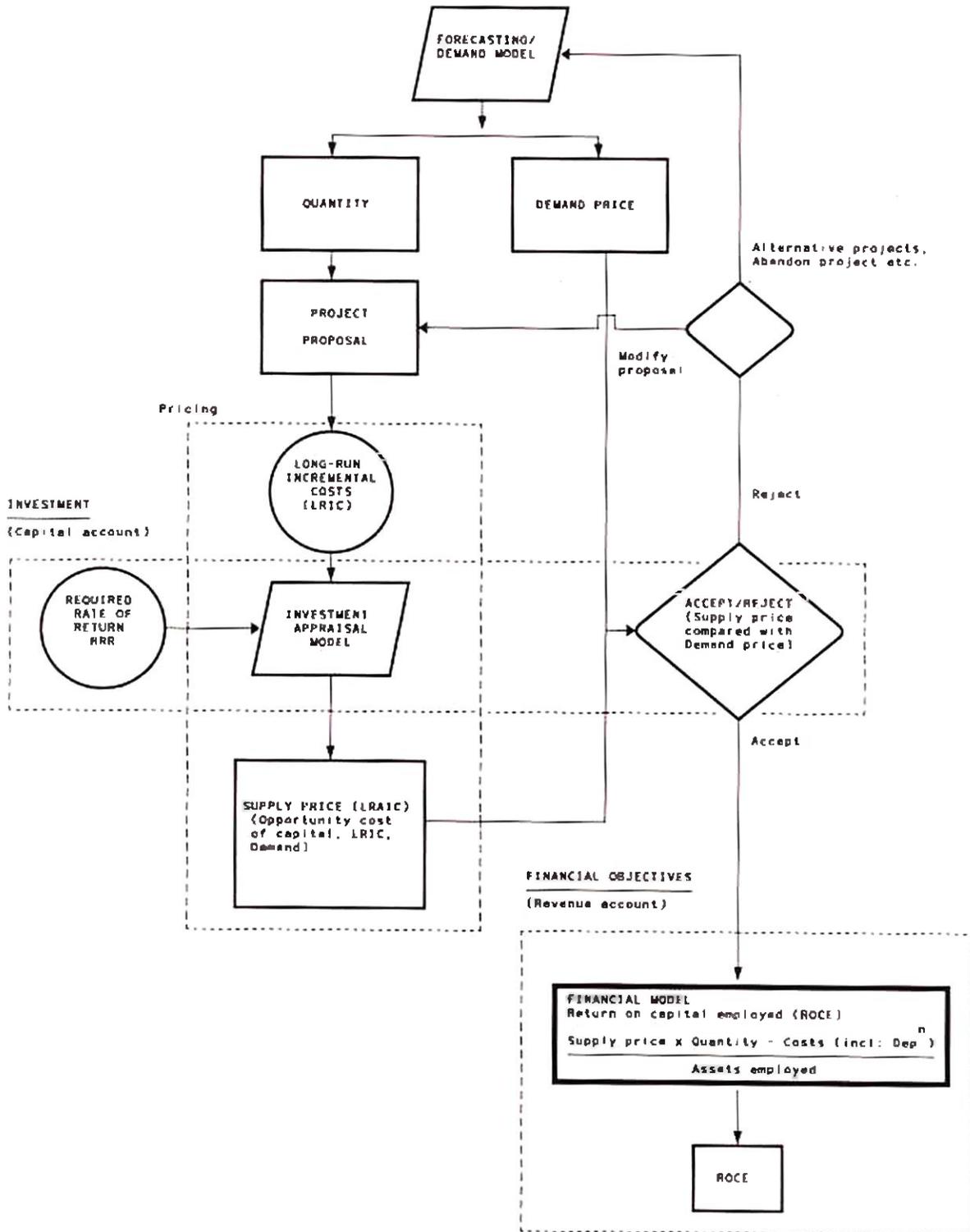
The adoption of the RRR in preference to the TDR was the result of two main factors. First, only a small percentage of investments had been

appraised using the TDR of the 1967 White Paper and second, it represented an attempt to relate the return on investment in the public sector to that in the private sector. In other words, it was attempting to recognize the opportunities foregone when one invests in the public sector (see figure I.1).

The pricing policy which emerges from the series of calculations is that price is related to long-run average incremental cost (LRAIC). Although this approach does not yield the long-run marginal cost (LRMC) (except in the constant returns to scale case) it does represent a closer approximation to LRMC than long-run average cost (LRAC) and thus was a workable interpretation of the 1967 White Paper's recommendation that prices should cover LRMC. In the section on pricing, the 1978 White Paper does reiterate the importance of the structure of prices, particularly that peak/off-peak rates should be related to the relative costs of supply and also that arbitrary cross-subsidization between different groups of consumers should be avoided.

The financial target as calculated above was to be set for three to five years, and would normally be expressed as a percentage return (before interest) on average net assets. However, in some industries, particularly those which are labour intensive, a more relevant measure would be a percentage return on turnover. The White Paper also recommends that as soon as possible, financial targets should be placed on an inflation adjusted basis.

Figure I.1 Schematic presentation of the recommendations in the 1978 White Paper "The Nationalized Industries"



ANNEX II

SUSTAINABILITY AND ENVIRONMENTAL ASPECTS

Sustainability is a concept which has a number of facets. In common usage it tends to be associated with environmental aspects; however, its scope is much wider than the environment. The Brundtland Commission¹ defined sustainable development as:

"development that meets the needs of the present without compromising the ability of future generations to meet their own needs"

This definition embodies the concept of environmental sustainability; it also incorporates project sustainability. In the context of a project, the World Bank describes project sustainability as follows:

The term "Sustainability" describes the ability of a project to maintain an acceptable level of benefit flows through its economic life. While this may often be expressed in quantitative terms involving the internal economic or financial rates of return, benefits may also be qualitatively assessed. For projects in the productive sectors such as industry, the principal measure of performance is output, generally expressed in terms of capacity utilization, but Bank-supported projects normally have other objectives such as subsectoral policies, technology transfer and institution building, which must be assessed qualitatively.²

A. Project sustainability

The tendency of Governments and international lending agencies has been to concentrate on the implementation of projects at the expense of the post implementation issues of management, operation and maintenance. As a consequence many projects are characterized by:³

- (a) An increase in maintenance costs and more rapid deterioration of infrastructure;
- (b) Reduction in the level and duration of project benefits;
- (c) Reduction in the quality of services;
- (d) Reduction in accessibility of certain groups to project benefits;
- (e) Low priority being placed on long-term institutional developments.

The issues associated with these observations are discussed elsewhere in this report under the headings of management, and human resources development aspects of regional economic cooperation.

B. Environmental sustainability

In addition to project sustainability, infrastructure developments can have a significant impact on the environment and health which "compromise the ability of [both the current and] future generations to meet their own needs". Part II of the 1990 *Survey* gave many examples of the effects of different types of infrastructure development on the environment.⁴

The utilization of tubewell irrigation for water supply infrastructure can lower the water table, resulting in land subsidence and deterioration in water quality. Uncontrolled irrigation with inadequate drainage systems and unlined irrigation channels has resulted in waterlogging of irrigated land, causing salinization of soils, thereby rendering the land unfit for cultivation. The construction of large dams for irrigation and hydroelectric power generation alters the hydrological regime of watersheds; can lead to accelerated soil erosion and siltation; impacts on wildlife; increases the incidence of waterborne diseases; reportedly leads to earthquakes by increasing pressure on seismically sensitive zones and presents social problems in the form of displaced communities to be resettled. Thermal power stations and road vehicles produce a wide range of pollution; oil spillages from ships have major effects on coastal wildlife, mangrove swamps, fish stocks and marine resources; and the

¹ Brundtland Commission, *Our Common Future* (Oxford University Press, New York), p. 87.

² World Bank, Operations Evaluation Department (OED), *Sustainability of projects: Review of experience in the fertilizer subsector* (Washington D.C., 26 February 1986).

³ OED, op. cit., p. 6.

⁴ ESCAP, *Economic and Social Survey of Asia and the Pacific 1990* (ST/ESCAP/949:Part II).

construction of roads into forest areas can lead to deforestation and the resulting soil erosion, siltation and floods.

Table II.1 provides a more comprehensive matrix of the environmental effects of various transport modes and energy sources used in power generation under the general headings:

- (a) Air pollution;
- (b) Pollution of the marine environment;
- (c) Consumption of land resources;
- (d) The production of solid waste which is required to be recycled or disposed of during operation or at the end of the project's life;
- (e) Noise and vibration;
- (f) The potential of an accident in the transport mode or power source to have further impacts;
- (g) Other impacts including the impact on local communities, farmland and wildlife, the production of carcinogens, and other external effects of infrastructure development.

There is a spectrum of policies which can be adopted by governments ranging from unconstrained freedom to exploit the environment (do nothing) to a total ban on the offending activity. In the face of the evidence available, the "do nothing" option is untenable. The total ban option can, apart from the problems associated with noncompliance, result in lower social welfare because a resource with low opportunity cost is not used and a resource with a higher opportunity cost has to be used in its place. The case can also arise where a total ban imposes a higher one on society, for example, appropriate management of a forest including fire breaks can reduce the extent of forest fires.

The optimum point in the spectrum is, however, not fixed and will depend upon such variables as income per capita, cost competition, price levels, interest rates, "sovereign rights" and knowledge of risks faced.

To a country with low income per capita the prospect of substantial earnings from the export of

hydro-electric power is likely to divert attention away from the environmental effects of constructing the dam; in a country facing strong cost competition in export markets there will be a tendency to pay less attention to the environmental impact of producing the export commodities; to a country which is struggling to achieve economic growth and development, pressure to improve environmental standards from countries which in the past have polluted their own environments and are currently producing much higher absolute levels of pollution than the struggling country are viewed as infringements on sovereign rights to exploit their own resources; to a country with high real interest rates there is a reduced incentive to take into account the longer-term environmental effects of current activities.

Consequently, there is no agreed basis by which environmental standards can be set. In the face of the evidence available, there is clearly cause for concern and action required. Such concern was expressed and action taken by the Commission in resolution 267(XLIV) "The adoption and implementation of the principle of environmentally sound and sustainable development in the Asian and Pacific region".

Since 1985, ESCAP has published in the Environment and Development Series *Guidelines* for undertaking environmental impact assessments (EIA) in various areas, including transport, water resources, industrial, agricultural and mining development as well as separate publications on tourism and ports.

The primary purpose of these *Guidelines* is to assist government agencies concerned with environmental protection in the developing countries in the planning and carrying out of environmental impact assessments (EIAs) for water resources development (WRD) projects. The *Guidelines* are prepared with the basic assumption that the objective and use of EIA is as a planning tool and that the environmental planning should be incorporated in the initial stages of project planning and integrated with other planning and implementation steps. In other words, the EIA is used for planning, implementing and monitoring environmental management measures to minimize, to an acceptable level, the adverse environmental impacts of a project and, where possible, to enhance beneficial impacts.

Table II.1 Selected environmental effects of infrastructure

<i>Infrastructure item</i>	<i>Air</i>	<i>Water resources</i>	<i>Land resources</i>	<i>Solid waste</i>	<i>Noise</i>	<i>Risks of accidents</i>	<i>Other impacts</i>
TRANSPORT MODE							
MARINE AND INLAND WATER TRANSPORT		Modification of water systems during port construction and canal cutting and dredging	Land taken for infrastructure; dereliction of obsolete port facilities and canals	Vessels and craft withdrawn from service (scrapping of vessels)		Bulk transport of fuels and hazardous substances	
RAIL TRANSPORT			Land taken for rights of way and terminals; dereliction of obsolete facilities	Abandoned lines, equipment and rolling stock	Noise and vibration around terminals and along railway lines	Derailment or collision of freight carrying hazardous substances	Partition or destruction of neighbourhoods, farmland and wild life habitats
ROAD TRANSPORT	Air pollution (CO, HC, NO _x , particulates and fuel additives such as lead)	Pollution of surface water and groundwater by surface run off; modification of water systems by road building	Land taken for infrastructure; extraction of road building materials	Abandoned spoil tips and rubble from road works; road vehicles withdrawn from service; waste oil	Noise and vibration from cars, motorcycles and lorries in cities, and along main roads	Deaths, injuries and property damaged from road accidents; risk of transport of hazardous substances; risks of structural failure in old or worn road facilities	Partition or destruction of neighbourhoods, farmland and wild life habitats; congestion
AIR TRANSPORT	Air pollution	Modification of water tables, river courses and field drainage in airport construction	Land taken for infrastructure; dereliction of obsolete facilities	Aircraft withdrawn from service	Noise around airports		
ENERGY SOURCE							
COAL	Air pollution; carbon dioxide release leading to 'Greenhouse' effect	Acid rain; impact on water stocks and soil	Mining impact; land taken for infrastructure, mining, transport, and power generation	Ash waste	Noise associated with mining and transport of coal	Increased exposure from large road, rail, sea freight tank out of fire, explosions	Creation of carcinogens, disruption of wild life and habitat

Table II.1 Selected environmental effects of infrastructure (continued)

<i>Infrastructure item</i>	<i>Air</i>	<i>Water resources</i>	<i>Land resources</i>	<i>Solid waste</i>	<i>Noise</i>	<i>Risks of accidents</i>	<i>Other impacts</i>
OIL	Air pollution; carbon dioxide release leading to 'Greenhouse' effect	Acid rain; impact on water stocks and soil	Land taken for drilling, well operators, pipelines, refineries and storage, and power generation		Noise associated with transport of oil	Risks of oil spills and refinery etc. fires	Creation of carcinogens and disruption of wild life and habitat
GAS	Carbon dioxide release leading to 'Greenhouse' effect		Land taken for drilling, well operators, pipelines, refineries and storage, and power generation		Noise associated with transport	Highly explosive	Creation of carcinogens and disruption of wild life and habitat
NUCLEAR			Land taken for uranium mining and infrastructure for power generation	Problem of disposal of radioactive waste and contaminated plant		Catastrophic potential if accident occurs	Potential creation of carcinogens
HYDRO		Modification of river flows and water tables	Land taken for storage purposes			Catastrophic potential if dam breached	Disruption of wild life and habitat; relocation of communities

Source: Organisation for Economic Cooperation and Development (OECD), *Transport and the Environment*, OECD, 1988 and ESCAP secretariat.

¹ Carbon monoxide = CO Hydrocarbons = HC Nitrous oxides = NO_x