EXECUTIVE SUMMARY

The Context and Objectives

Infrastructure is a key factor in economic development. Infrastructure development can also help in narrowing gaps between developed and backward regions. Infrastructure, especially transport and connectivity, is crucial for regional cooperation and integration. In the absence of efficient physical connectivity, any initiatives taken towards regional trade liberalization will remain ineffective. The Association of Southeast Asian Nations (ASEAN) secretariat has identified infrastructure development as one of the Priority Integrated Sectors (PIS) of the ASEAN economic community. It would also be of crucial importance for programmes of regional economic cooperation and integration within the East Asia Summit (EAS) framework. It was in that context that infrastructure development was studied as part of the work programme of the Economic Research Institute for ASEAN and East Asia (ERIA).

This project aims to analyze the current status, issues, and challenges facing infrastructure development in East Asia and examine the role that regional cooperation can play in meeting these challenges. Specific objectives include 1) examining infrastructure rankings of EAS countries in terms of availability and quality of infrastructure development globally as well as within the region and progress made over time; 2) surveying and analyzing the status of infrastructure development, issues, and challenges faced by different EAS countries; 3) collecting basic geographical data at the subregional level and developing a spatial economic model to simulate various effects

of infrastructure development on contiguous subnational regions.

Methodology

The study adopted a three-pronged approach to achieve its objectives.

The methodology followed included the construction of an East Asian Index of Infrastructure Development. This was followed by detailed case studies of infrastructure development and the challenges it faces in 11 EAS countries. Finally, simulations were conducted of the long-term impact of logistic infrastructure development in contiguous regions in East Asia.

a) Construction of an East Asian Index of Infrastructure Development

Following the methodology developed by an earlier RIS study, an attempt was made to develop a comprehensive regional infrastructure index considering the different aspects of infrastructure. This was done to examine the relative rankings of different EAS countries globally and among themselves, including changes in their relative rankings over a 15-year period. This comprehensive index helped improve understanding of the infrastructure gaps that exists between EAS countries and which should be addressed within a programme of regional economic cooperation.

b) Country Studies of Infrastructure Development and Challenges

Detailed country studies for nine EAS countries were conducted to examine the current status of ongoing infrastructure-development projects in each, analyze the data to

address the country-specific issues, and come up with perspectives on infrastructure development.

c) Modeling and simulations

This methodology involved analyzing the long-term impact of logistic-infrastructure development in contiguous regions using simulation supported by the theory of spatial economics and collected regional data sets. Modeling and simulation were done to check the possibility of the occurrence of long-term problems that are not easily predicted by other research methods.

Findings and Conclusions

East Asian Index of Infrastructure Development

Based on the estimated scores of infrastructure index for three separate years, we ranked the countries in descending order. As expected, developed countries occupy the top ten positions in infrastructure development—one country from North America (the United States), two from Asia (Japan and Singapore), and seven countries from Europe. Least developed countries (LDCs) from Africa and Asia (e.g., Myanmar and Cambodia) occupy the bottom ten while developing countries are in the middle ranks.

Based on the estimated ranks, LDCs and landlocked countries worldwide suffer most from infrastructure inadequacy. Within East Asia (ASEAN+6), we find a heterogeneous group. Japan, Singapore, and New Zealand occupy the top three positions. These three countries, along with the Republic of Korea, are also among the

top fifteen worldwide. Lao People's Democratic Republic (Lao PDR), Myanmar, and Cambodia occupy the bottom three in East Asia. Among the sixteen East Asian countries, ten successfully moved up the global ranking between the years 1991 and 2005 while the ranking of six other countries deteriorated. On the whole, the index reveals very wide gaps in infrastructure availability across the EAS region. This gap seems to have widened rather than narrowed over time. Hence, infrastructure development in the lagging regions needs to be given attention if the regional inequalities are not to widen further. The index could be developed further to analyze the role of other aspects of infrastructure, including social infrastructure, and examine its interaction with other variables of socioeconomic development as well as its role in determining the investment climate.

Ranking of East Asian Countries in Infrastructure Development

Country	1991	2000	2005
Japan	5	4	2
Singapore	6	2	3
New Zealand	13	12	14
Korea	26	15	15
Australia	7	16	16
Malaysia	37	27	29
Brunei	27	31	36
China	49	43	39
Thailand	43	38	42
India	50	49	51
Vietnam	92	75	61
Indonesia	69	63	62
Philippines	76	65	63
Lao PDR	99	84	92
Myanmar	90	91	95
Cambodia	100	93	98

Summary of Findings from Country Studies

The country studies highlight a number of issues, experiments, and challenges faced by EAS countries in terms of developing infrastructure, including raising resources, relative roles of public and private sectors, models of public-private partnership (PPP), institutional and regulatory capacity, regional inequalities and cross-subsidization of infrastructure delivery, policy issues or soft infrastructure that includes regulations and procedures. A brief summary of findings from each country report follows.

Cambodia

Compared to the infrastructure of other countries in the region, Cambodia's is still in poor condition due to the war, poor master planning, and lack of maintenance. Most passengers and freight use road transport while other means of transportation are relegated to a complementary role. Cambodia's inadequate physical infrastructure, which includes road transportation, electricity, irrigation and water systems, and port facilities, is a major barrier to economic development and poverty reduction. Hence, infrastructure networks can and should be assigned a leading role in supporting the development process.

Considerable investment, capacity building, new policies, and institutional reform are required to overcome this bottleneck. It is a challenge that goes beyond the public sector and needs to involve the private sector. This, in turn, will require new approaches to the provision of infrastructure services and new financing mechanisms. It will also require

the support of development partners. Moreover, considerable progress has been made over the last decade or so towards increased intercountry movement of road transport in Asia, and the basic framework for this movement is being set in place. Cambodia still needs huge investments in infrastructure. Therefore, the government should have a long-term plan to build infrastructure with participation from the donor community and the private sector.

China

Although China's infrastructure has developed rapidly in recent years, its rural roads, railroads, aviation infrastructure, and water and electricity infrastructure are still in need of further development. The issues to be addressed are varied. The imbalanced development of infrastructure among the different regions has caused some conflict between supply and demand and become a barrier to the socioeconomic development of some regions.

The tax reforms implemented in the 1980s decentralized the authority to manage public funds; hence, the national government is unable to provide funds for infrastructure development in the regions. Poor infrastructure management, in turn, has resulted in the low transportation capacity of roads and railways, putting even more pressure on crowded cities and pillar transportation lines.

The low operational efficiency of the infrastructure can also be traced to lay behind software construction, sector-orientated management, poor sectoral coordination, and

lack of joint planning.

There are also various issues with policies and regulations, such as an incomprehensive policy system and a legal system that could stand some improvement. In addition, institutional reforms are also required.

The development of rural infrastructure and that of the western and central regions should be prioritized to narrow the disparities between urban and rural areas and between the western and eastern regions. Private-sector investment should be mobilized not only to promote the viability of financing sources but also to strengthen cooperation between the government and the private sector in infrastructure development. The financing mechanism should be institutionalized and regulated to promote the integration of resources. Innovative financing mechanisms should also be applied to fit different circumstances. Infrastructure development can be further promoted by learning from the experiences and lessons of other countries.

Other areas that should be addressed include logistic hubs and multimodal transportation, human resource development (HRD), and the strengthening of bilateral agreements involving tariff reduction, facilitation of immigration procedures, freight transit, customs and visa services, among others.

India

Provision of quality and efficient infrastructure services is essential to realize the full

growth potential of the Indian economy. There is now widespread consensus that exclusive dependence on government for the provision of all infrastructure services introduces difficulties concerning adequate scale of investment, technical efficiency, proper enforcement of user charges, and competitive market structure. At the same time, complete reliance on private production, particularly without appropriate regulation, is also not likely to produce optimal outcomes.

While stepping up public investment in infrastructure, India has been actively engaged in finding the appropriate policy framework, which gives the private sector adequate confidence and incentives to invest on a massive scale, but simultaneously preserves sufficient checks and balances through transparency, competition, and regulation. Strong and well-recognized linkages exist between infrastructure, economic growth, and poverty alleviation. Infrastructure will encourage economic growth. In turn, robust economic growth will promote investment in infrastructure by enhancing the people's willingness to pay appropriate user charges.

The outlook for infrastructural improvement in India looks promising. With experience gained in PPPs, formulation of model PPP and concession agreements, infrastructure investments should gain momentum over the coming years. Outlook in infrastructure will depend on how investment in infrastructure is facilitated. Such investment requires long-term funds with long payback periods, for example, from insurance and pension funds. Thus, success on the infrastructure front will be facilitated by the development of a vibrant bond market and pension and insurance reforms. A single, unified

exchange-traded market for corporate bonds would help create a mature debt market for financing infrastructure.

Indonesia

The infrastructure condition in Indonesia has been in crisis over last ten years. Roads in urban areas are severely congested, and many subnational roads are poorly maintained. Although the telecom infrastructure coverage has increased, actual access to telecommunication services remains uneven, and Indonesia's teledensity still lags behind that of its neighbors,

Access to electricity is a problem, particularly for those below the poverty line. At the same time, load shedding—the immediate cutting of power to customers—occurs in Bali and Java while the other main islands also experience severe power shortages.

The percentage of the population with access to piped water has actually fallen, while water quality and regularity of service delivery are also declining. We found that the low access to, and the poor quality of, infrastructure services in Indonesia are caused by a combination of sectoral and cross-sectoral problems. The cross-sectoral issues include institutional problems, financing problems, pricing problems, competition, corporatization, and privatization problems.

Lao PDR

Lao PDR's socioeconomic development is constrained by its being landlocked and its poor infrastructure. The government has introduced a "landlinked" strategy in conjunction with regional and subregional infrastructure development, particularly within the framework of the ASEAN, the Greater Mekong Subregion (GMS), the Triangle Development Area, etc.

Said strategy addresses the importance of infrastructure development, particularly the development of the road/transport sector, as the means to achieve the country's vision of removing itself from the list of LDCs by 2020 and eradicating mass poverty by 2010.

Infrastructure development has been identified as significant both for poverty reduction and private-sector development. The construction of farm-to-market roads, for example, is seen as a means of reducing poverty in the countryside by linking farmers to buyers in other areas. The improvement of logistic infrastructure, particularly factory-to-port transportation, is another way of enhancing business performance, export development, and economic growth. The choices for logistic transportation should also be expanded as a long-term strategy for infrastructure development.

Malaysia

There are four main conclusions to be drawn from the Malaysia's part of the research. First, since its independence, it has deployed substantial amounts of resources for the

expansion and improvement of infrastructure. Generally each five-year plan saw increasing allocation for investment in infrastructure. Second, the private sector is now a major player in the development and operation of infrastructure in the country. Statistics on private-sector investment in infrastructure since the implementation of the government's privatisation policy are difficult to obtain. However, there is sufficient evidence to show that the privatisation contributed to an increase in investment in infrastructure. It is even possible to assert that in the absence of privatisation, the stock of infrastructure in Malaysia would not have expanded as much or as quickly as it has. Third, while some infrastructure components witnessed relatively large outlays of investments compared to other components, there is also no denying that all segments of the sector witnessed significant growth in investment. Finally, the massive investments in infrastructure have contributed to the growth in the capacity and stock of infrastructure in the country and in its modernisation and technical development.

Singapore

Singapore's infrastructural development has been often guided and driven by government agencies set up for that purpose. Singapore formulated a comprehensive development plan in 1955 based on the "ring concept"—high-density satellite towns linked to the Central Business District (CBD) by expressways and a rail system.

One of the most pressing national concerns following independence was the lack of public housing, which the Housing and Development Board (HDB) was tasked to solve. The HDB was able to provide low-cost housing to Singaporeans.

Singapore has a world-class seaport and airport. The Port Authority of Singapore (PSA) handles about one-fifth of the world's total container transshipments throughput. In 2006, it began offering a comprehensive range of "soft" services ancillary to the physical handling of cargo. These ancillary services cover the entire maritime and logistics value chain, including insurance, brokerage, arbitration, and financing. To sustain Changi Airport's elite hub status, the government opened a Budget Terminal in October 2006 and Terminal 3 in January 2008. Changi is a good example of Singapore's efforts to regionalize its infrastructure business. Singapore's airport management, its associated and related companies, and infrastructure management have impressed many overseas airport operators and inspired them to initiate partnerships and investment opportunities.

With global demands necessitating improved information access, Singapore has moved away from low-value-adding manufacturing and is carving a niche for itself in the provision of infrastructure for research and development (R&D) and information technology (IT). It is now also trying to develop various industrial parks outside the country to spread its knowledge and experience in infrastructure development for industrialization.

Thailand

Roads are the most widely used mode of transportation for the movement of domestic goods in Thailand, which has a number of nodes that provide multimodal transfer points

for air and sea shipments to facilitate trade services of major products and goods. At the regional level, Thailand has developed bilateral frameworks with its neighbors to create a transport and logistics network across the region via land-border points. Regarding railroad, all rail routes have connections with roadway transportation and logistics, but the most important hubs for distributing products are Bangkok Port, Laem Chabang Port, and ICD Lat Krabang.

In the past, the development of Thailand's transport and logistics infrastructures has been significantly influenced by the official policies of the Thai government, but not collectively of the Greater Mekong Subregion's. However, this, under the pressure of global competition tends to change toward more regional missions. Thailand's development agenda is outlined in a development plan designed by the National Economic and Social Development Board. Currently, the national agenda considers the following issues: competitiveness, logistics, poverty and income distribution, and sustainable development. Thailand intends to become a world-class provider of logistical support for business and trade in the Indochina region. Strategic topics are (1) business logistics improvement; (2) new trade lanes and logistics network optimization; (3) logistics service internationalization; (4) trade facilitation enhancement; and (5) capacity building.

Viet Nam

The state of Viet Nam's transport infrastructure makes it difficult for the country to post socioeconomic improvements. In response to the changes in the local and international

economy, the government in 2004 redefined its strategy for the development of transport infrastructure by 2020. The comprehensive strategy covers road, railway, sea, inland waterways, and air transport.

One of the important issues in the development of such infrastructure is funding, The government plans to secure such funding through the state budget and through private funds using Build-Operate-Transfer (BOT), Build-Transfer (BT), or Build-Transfer-Operate (BTO) contracts with local and foreign investors. It is now taking various measures to attract more foreign investments. These measures include crafting a legal framework to facilitate the flow investment, especially to the transport sector.

Indo-ASEAN Logistic Network

Even though India and the ASEAN are geographically contiguous with shared borders between India and Myanmar and centuries-old cultural and trade links, exploitation of the full potential of regional economic integration is constrained by poor transport connectivity. To strengthen the Indo-ASEAN logistics network, the following three issues may be addressed: 1) strengthening Indian domestic physical transportation infrastructure; 2) setting up a multimodal Indo-ASEAN logistics network; 3) ensuring transportation quality as value-added logistics.

Geographical Simulation Model for ERIA

The first important finding is that border costs play a big role in the location choice of population and industries. The simulations done using IDE/ERIA-GSM revealed that physical infrastructure alone is not enough to capitalize on a location's advantages. It is obvious that border costs are an obstacle to the regional development.

The second finding is that the difference in nominal wage is an important determinant of agglomeration. In continental South East Asian countries, there is quite a large difference in nominal wage not only internationally but also intranationally. We found that several "core" regions emerged repeatedly in the simulation's quite large range of parameters. Bangkok, in particular, should be noted as a robust "core" region, having both higher nominal wage and locational advantages. However, the importance of the initial difference in nominal wage does not mean that spatial economics does not matter at all. On the contrary, infrastructure developments have the power to amend regional inequality caused by the initial difference in nominal wage to some extent. There is a need to develop the IDE/ERIA-GSM simulation model further to cover China, India, and the Mekong region. This is in view of the increasing level of cooperation between India and Myanmar for the development of trilateral highways, inland waterways, and rail links to improve connectivity between India's northeast region and Myanmar.

SOME POLICY RECOMMENDATIONS

An East Asian Infrastructure Development Committee for Sharing Best Practices and Promoting Regional Cooperation

The country studies highlight a number of issues, experiments, and challenges faced by EAS countries in terms of developing infrastructure. These include raising resources; relative roles of public and private sectors; PPP models; institutional and regulatory capacity; regional inequalities; development of rural infrastructure; cross-subsidization of infrastructure delivery; and policy issues or soft infrastructure. The latter cover regulations and procedures with regard to customs valuation, cabotage rules, and conformity assessment procedures, among others.

Given the richness of the experiments, there is tremendous opportunity to learn from one another and share development experiences across EAS countries, (e.g., development of the ASEAN's single window; the Indian experience in funding its highway-development programme through the imposition of taxes on petroleum sales; the Japanese experience in modernizing its transportation sector; experiments on viability gap funding for PPP in India, etc.). The study group, therefore, recommends the establishment of a structured dialogue between the infrastructure authorities of EAS countries, especially authorities involved in transport, to facilitate mutual cooperation and sharing of development experiences and expertise for capacity building. This mechanism, the East Asian Infrastructure Development Committee, could report to meetings of the EAS infrastructure and transport ministers.

A Regional Financing Mechanism for Infrastructure Development

The East Asian infrastructure index reveals very wide gaps in terms of infrastructure availability across the EAS region, which seem to have widened rather than narrowed over time. Hence, infrastructure development in the lagging regions needs to be paid due attention if the regional inequalities are not to widen further.

In order to bridge the regional infrastructure deficits, a huge amount of resources--estimated to be between US$200 billion to US$500 billion per year—is needed. On the other hand, the region's foreign exchange reserves now add up to more than US$3 trillion, far in excess of the region's Balance-of-Payments (BPO) liquidity needs. These foreign exchange reserves remain invested in western securities, earning negative rates of return in the absence of a regional framework for their fruitful deployment. The study group's attention was drawn to an RIS proposal of a regional mechanism created to mobilize a very small proportion of these reserves for the development of regional cross-border connectivity and other highly productive infrastructure. It might also assist in generating new demand within the region and help in adjusting global imbalances. The group felt that this proposal needs to be examined further by the EAS policymakers, including the modalities for operationalising the regional mechanism through exiting regional institutions or creating a new one.

Cooperation in Trade Facilitation for Cross-border Trade

The group concluded that the development of efficient logistics infrastructure and network is crucial for regional economic cooperation and development. Similarly, border infrastructure for efficient handling of cargo is also very important for promoting cross-border trade. EAS needs to pay greater attention to trade facilitation, including cooperation between customs authorities for the introduction of information and communication technology (ICT), reduction of paper work, harmonization and standardization of rules and standards, conformity assessment procedures, and mutual recognition arrangements to reduce transaction costs. One of the most important issues is to make customs and immigration procdures more efficient. The clearance times at the borders should be monitored and evaluated. The introduction of a common, harmonized document for customs and immigration is also a realistic solution to this issue. The revision of the "cabotage" policy might likewise be necessary along with the introduction of an East Asian common radio frequency identification (RFID) system for logistics.

Cooperation for Collection of Statistics

Better statistics, especially at the subnational level in each country, are needed to facilitate research on infrastructure development. It is important to establish a uniform territorial unit for geographical statistics specifically for East Asia. In Europe, Eurostat established the Nomenclature of Territorial Units for Statistics (NUTS) more than 25

years ago. A similar concept could be considered in East Asia (EA-NUTS). There is also need for more precise data on routes and infrastructures connecting regions and the border costs or transaction costs caused by inefficient custom procedures.

INFRASTRUCTURE DEVELOPMENT IN EAST ASIA: An Introduction

As a key factor in economic development, infrastructure development occupies a central place in development policy and planning of developing countries. Infrastructure development can also help in narrowing development gaps between developed and laggard regions. Cross-border transport infrastructure and connectivity facilitates that benefits of trade liberalization can be reaped by the local producers and consumers. Hence, transport connectivity and cross border facilitation would be key components of any scheme of regional economic integration.

It was in that context that a study of infrastructure development in East Asia was included in the ERIA work programme in the initial phase itself. The study attempted to examine the current status, issues and challenges facing infrastructure development in East Asia and consider the role that regional cooperation can play in meeting these challenges.

The study was launched in July 2007 at the inception workshop held in Bangkok. Despite the short time frame at its disposal, it has managed to complete a significant body of work as summarized in this volume, thanks to committed work of the participants and IDE/JETRO coordinators.

In particular, the study analyzed the place of East Asian or EAS countries in terms of infrastructure attainment in a global comparative perspective. As there are many aspects

of infrastructure, a unique comprehensive infrastructure index capturing 10 aspects of infrastructure was developed for 104 countries for three points of time. Some patterns emerge over time with some countries upgrading themselves by paying due attention to infrastructure development while others neglect and slip the ranks. The index also suggests that the gaps between the most developed and the least developed are very wide and may have widened over time. An immediate policy implication following from this would be about the huge magnitude of the resources required for narrowing or bridging these gaps. While it may appear to be an enormous challenge, there are possibilities of turning it into an opportunity for further enhancing the dynamism of the region besides addressing the global imbalances in a win-win manner with the help of some proposals of regional financial cooperation as discussed.

The country studies in 9 selected EAS countries examine the status of infrastructure development and issues and challenges faced by them. These studies highlight a variety of experiments being conducted in different countries for infrastructure development including raising resources, relative roles of public and private sectors, models of public-private partnership (PPP), institutional and regulatory capacity, regional inequalities, development of rural infrastructure, and cross-subsidization of infrastructure delivery, policy issues or soft infrastructure, among others. Given the richness of experiments, there is tremendous scope for learning from each other and sharing developmental experiences and ‘best practices’ across EAS countries. Therefore, study recommends an institutionalization of learning from each other and mutual cooperation.

The study is able to demonstrate with the help of a geographical simulation model, benefits of highway development in the Indo-China region on contiguous sub-national regions. This kind of simulation models can be of great relevance for policy makers for identifying the transport corridors that optimize the benefits from given investments in terms of regional development.

Finally, the study highlights the importance of trade facilitation for fully exploiting the benefits of geographical contiguity and physical connectivity. Tedious custom procedures may undo the benefits of good physical connectivity provided by highway links. Hence, it needs to be paid due attention in the programmes of regional cooperation and integration.

It was a pleasure for me personally and RIS to be involved in this ERIA study along with researchers from different EAS countries. The experience was made particularly fruitful by commitment showed by all the members of the project, as listed in the volume and institutional partners. They delivered expected output in timely manner following pressing schedules.

I would like to put on record my appreciation to IDE/Jetro researchers especially Mr Satoru Kumagai and his colleagues viz. Mr Isono and Mr Gokan [pls put the full names and check spellings], for coordinating the project in a very dedicated and competent manner. I am also grateful for the generous support the project received from the Japanese Government as a part of ERIA activities.

In the context of the well-deserved focus of ERIA on narrowing development gaps and deepening regional economic integration, I believe that infrastructure development and cooperation is an area of critical importance. This volume presents a valuable reference material for further work on the subject. I am therefore, happy to commend this volume to the policy makers and researchers in the EAS region.

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New Delhi, 26 February 2008

Chapter 1: East Asian Infrastructure Development in a Comparative Global Perspective: An Analysis of RIS Infrastructure Index

Nagesh Kumar and Prabir De

1. Introduction

Infrastructure is a key factor in driving a country's growth and development. As public goods, availability of quality infrastructural facilities assists in mobilizing private investments by reducing the magnitude of required investments. Infrastructure development can also help in narrowing development gaps between developed and laggard regions. Infrastructure, especially transport and connectivity, is crucial for regional cooperation and integration. In the absence of efficient physical connectivity, any initiatives taken towards regional trade liberalization will remain ineffective.

Role of infrastructure in fostering economic development and integration has been supported by the empirical literature. A number of studies have highlighted the importance of physical infrastructure as a determinant of economic growth (e.g. Aschaur 1989; Easterly and Rebelo 1993; and Gramlich 1994; World Bank 1994, for reviews). Favourable role of physical infrastructure in influencing the patterns of foreign direct investment (FDI) inflows has been corroborated by a number of studies (e.g. Loree and Guisinger 1995, and Mody and Srinivasan 1996, Kumar 1998, 2000, 2002a, 2002b). Kumar (2002a) argued that quality of physical infrastructure could be a

particularly important consideration for locational choices for efficiency-seeking or export-oriented FDI flows, a proposition that was supported by the empirical analysis.

A problem faced by empirical studies in a cross-country context while analyzing the role of infrastructure availability is that of measurement of availability of the different components of infrastructure objectively. There are many aspects of infrastructure, for instance, transportation facilities like road network, ports, airports etc., communication infrastructure covering telecommunication network; information infrastructure; energy availability, etc. (see, World Bank, 1994, for indicators of different aspects). A country may be strong in road infrastructure but may have poor telecommunication or information infrastructure. Hence, a measure of either road transport infrastructure or telecommunication infrastructure would not adequately capture the overall quality or availability of infrastructure. At the same time, an objectively measured and constructed single comprehensive indicator of infrastructure availability is very important, but not available. World Economic Forum Reports provide country scores and country rankings on infrastructure, among many other indicators. However, these scores suffer from some problems of measurement and construction that limit their usefulness in quantitative analysis. Firstly, the scores are based on subjective perceptions of businessmen in different countries on different aspects of infrastructure availability and quality and not on any objective measurement. The aspects of infrastructure covered are changed over the years so the rankings of countries are not comparable over time. Finally, different aspects of infrastructure are averaged to obtain a single index of infrastructure.

Assigning equal weights to different aspects of infrastructure, although convenient, may not be appropriate conceptually.

To overcome the problems of infrastructure measurement in inter-country context, Kumar (2002a, 2002b) developed an Infrastructure Index based on six indicators capturing transport infrastructure, communication and information infrastructure and energy availability using principal component analysis for a sample of 66 countries for three points of time viz. 1982, 1989, and 1994. This Infrastructure Index was able to successfully explain the inter-country variation in the patterns and quality of FDI inflows across sample countries, holding other factors constant. In context of South Asia, De and Ghosh (2003, 2005a) constructed a composite index of infrastructure development across the South Asian countries and found that rising inequality in infrastructure are responsible for widening income gap in South Asia. While dealing with infrastructure and regional income, De (2005a, 2005b) constructed infrastructure development indices and found that infrastructure facilities positively influence the countries growth in Asia, where quality of transport infrastructure is an important determinant of Asia's trade and transaction costs. Similar infrastructure indices also constructed by De and Ghosh (2004, 2005b) for Indian states while dealing with infrastructure and development in context of India.

Against the aforesaid background, this paper constructs an Infrastructure Index for 104 countries comprising all the EAS members for three points of time, namely 1991, 2000, 2005 (hereinafter, we call it *RIS Infrastructure Index, RII)*. The global coverage enables

us to get a comparative perspective on the infrastructure attainment of EAS countries while three points of time allow us to observe the movement of countries within the sample in terms of development of infrastructure. The paper makes observations on the gaps between EAS countries in terms of infrastructure development, their overtime performance and provides some policy recommendations for narrowing these gaps.

2. A Comprehensive Measurement of Infrastructure Availability and Country Positions

Here, we briefly summarize the methodology and data sources for constructing an RIS Infrastructure Index (RII) covering 104 countries including all the 16 EAS countries. As observed above, there are several aspects of physical infrastructure which complement each other, such as telecommunication, transport, and banking infrastructure. While these indicators are correlated among themselves in some cases (see Canning 1998), none of them will capture the overall availability of infrastructure adequately. A country may have a very good network of roads but a telecommunication infrastructure that is not so good, for example. Therefore, the statistical technique of principal component analysis (PCA) becomes handy in constructing a unique single index that captures the variance or information contained in different variables capturing different aspects of infrastructure. PCA finds linear combinations of the original variables to construct the principal components or factors with a variance greater than any single original variable.

$$RII_{it} = \sum W_{jt} X_{jit} \qquad (1)$$

where RII_{it} = RIS Infrastructure Index of the i-th country (104 countries) in t-th time (namely, 1991, 2000 and 2005), W_{jt} = weight of the j-th aspect of infrastructure in t-th time, and X_{jit} = value of the j-th aspect of infrastructure for the i-th country in t-th time point. Each of the 10 infrastructure variables is normalized for the size of the economy so that it is not affected by the scale. Here, W_{jt} are estimated with the help of PCA.

The aspects of infrastructure covered in the construction of the composite index and their measurements are as follows:

Transport Infrastructure: There could be several aspects of transport infrastructure such as availability of and quality of roads, railways, air transport and ports. In view of the availability of comparable indicators, we have employed following five indicators for capturing the availability and quality of transport infrastructure: (i) Air Transport is captured with the help of passengers carried per 1000 population and air freight million tonnes per kilometres of area, (ii) Road infrastructure is captured by the length of roads network per 10,000 sq. km. of surface area, and percentage share of paved roads, (iii) Railway infrastructure is captured through length of railway lines per 10,000 sq. km. of surface area.

ICT Infrastructure: The availability of ICT infrastructure is captured with the help of teledensity, and density of computers and internet. Total number of telephones (mobiles and fixed line) lines per 1000 inhabitants is a measure of teledensity. Number of personal computers per 1000 inhabitants and internet users per 1000 inhabitants are used to capture IT penetration.

Energy Availability: Energy availability is captured by intensity of energy use viz. energy use (kWh) per inhabitant.

Banking Infrastructure: Domestic credit provided by the banking sector (as percent of GDP) was employed as a measure of availability of banking infrastructure.

The data sources include issues of *World Development Indicators* CD ROM, *CIA Fact Year Book*, country reports (collected through IDE-JETRO), and other secondary sources.

3. East Asian Countries in the World in terms of Infrastructure Attainment

The infrastructure index scores and ranks for the 104 countries for the years 1991, 2000 and 2005 are computed following the methodology outlined above, and are summarized in Table 1. The countries are listed as per their ascending order of ranking in 2005.

Figure 1 presents the rank of countries. The patterns that emerge from the Table 1 are on expected lines, and some important observations are as follows:

First, developed countries occupy the top ten positions in infrastructure development, of which one from North America (USA), two from Asia (Japan and Singapore) and remaining seven countries are from Europe. The bottom ten positions are occupied by LDCs from Africa and Asia. For example, Myanmar and Cambodia are from Asia, and rest eight countries are from Africa. Developing countries occupy the middle portion of the ladder. Given the estimated ranks, LDCs and land-locked countries across the world suffer more due to infrastructure inadequacy.

Second, the East Asian countries (ASEAN+6) comprise a heterogeneous group characterized by wide gaps in infrastructure attainment. As shown in Table 2 and Figure 2, Japan, Singapore, New Zealand, South Korea and Australia find themselves among the first 16 countries in the world. The next group comprises developing countries including Malaysia and Brunei, China, Thailand, and India within 55 countries in the world. Vietnam, Indonesia, Philippines, Lao PDR, Myanmar and Cambodia occupy the bottom six positions in East Asia. In general, the rankings in infrastructure attainment seem to relate to their levels of development.

Table 1: RIS Infrastructure Index Scores and Ranks of Countries

	1991		2000		2005	
	Index	Rank	Index	Rank	Index	Rank
United States	25.96	1	22.95	1	20.66	1
Japan	16.28	5	18.65	4	18.58	2
Singapore	15.73	6	20.11	2	17.66	3
Switzerland	19.07	4	19.43	3	17.19	4
Netherlands	14.22	11	17.20	7	17.18	5
Denmark	14.81	9	17.74	6	16.95	6
Sweden	19.39	3	16.89	8	16.70	7
Ireland	10.43	18	14.41	14	16.12	8
United Kingdom	14.87	8	15.59	9	15.93	9
Norway	21.28	2	17.94	5	15.56	10
Germany	13.25	12	15.56	10	15.20	11
Austria	11.96	16	15.14	11	14.67	12
Canada	14.55	10	14.69	13	14.37	13
New Zealand	12.92	13	14.88	12	14.11	14
Korea	7.78	26	13.97	15	13.68	15
Australia	14.92	7	13.00	16	13.67	16
France	12.87	14	12.69	17	13.59	17
Israel	9.72	19	11.37	20	13.28	18
Bahrain	11.99	15	11.41	19	13.09	19
Italy	9.38	21	11.93	18	12.93	20
Slovenia	7.56	28	10.32	24	12.68	21
Qatar	9.70	20	10.83	22	12.11	22
Spain	8.98	22	10.98	21	11.98	23
United Arab Emirates	8.06	23	10.74	23	11.06	24
Kuwait	10.46	17	8.71	26	10.55	25
Slovak Republic	6.63	31	7.77	30	10.38	26
Portugal	6.96	29	9.86	25	10.19	27
Czech Republic	7.96	24	8.19	29	9.64	28
Malaysia	5.10	37	8.65	27	9.21	29

Greece	7.85	25	8.60	28	8.84	30
Croatia	6.20	32	6.47	33	8.48	31
Poland	5.02	38	6.26	36	8.15	32
Hungary	4.95	39	6.34	35	7.99	33
Mauritius	5.15	36	6.40	34	7.41	34
Lebanon	3.90	47	6.86	32	7.35	35
Brunei	7.76	27	7.27	31	7.34	36
Bulgaria	6.77	30	5.19	42	7.18	37
South Africa	3.62	48	5.46	39	6.42	38
China	3.51	49	4.83	43	6.33	39
Jordan	5.28	35	5.28	41	6.19	40
Russia	5.86	33	4.00	48	6.01	41
Thailand	4.17	43	5.48	38	5.89	42
Saudi Arabia	4.48	40	4.09	45	5.88	43
Romania	4.21	42	3.92	50	5.76	44
Uruguay	4.07	44	5.69	37	5.62	45
Ukraine	5.59	34	4.09	46	5.25	46
Turkey	2.59	61	4.00	47	5.21	47
Chile	2.96	57	5.45	40	5.20	48
Egypt	3.98	46	4.18	44	5.09	49
Tunisia	3.18	52	3.49	53	4.58	50
India	3.48	50	3.95	49	4.49	51
Mexico	2.54	63	3.07	58	4.44	52
Sri Lanka	2.57	62	3.18	56	4.35	53
Argentina	2.37	65	3.70	52	4.33	54
Brazil	3.08	54	3.31	54	4.24	55
Oman	2.31	66	3.26	55	4.05	56
Iran	2.73	60	3.07	57	4.03	57
Kazakhstan	4.24	41	2.85	59	3.68	58
Venezuela	3.07	55	2.78	62	3.39	59
Georgia	4.05	45	3.83	51	3.31	60
Vietnam	0.91	92	1.85	75	3.27	61

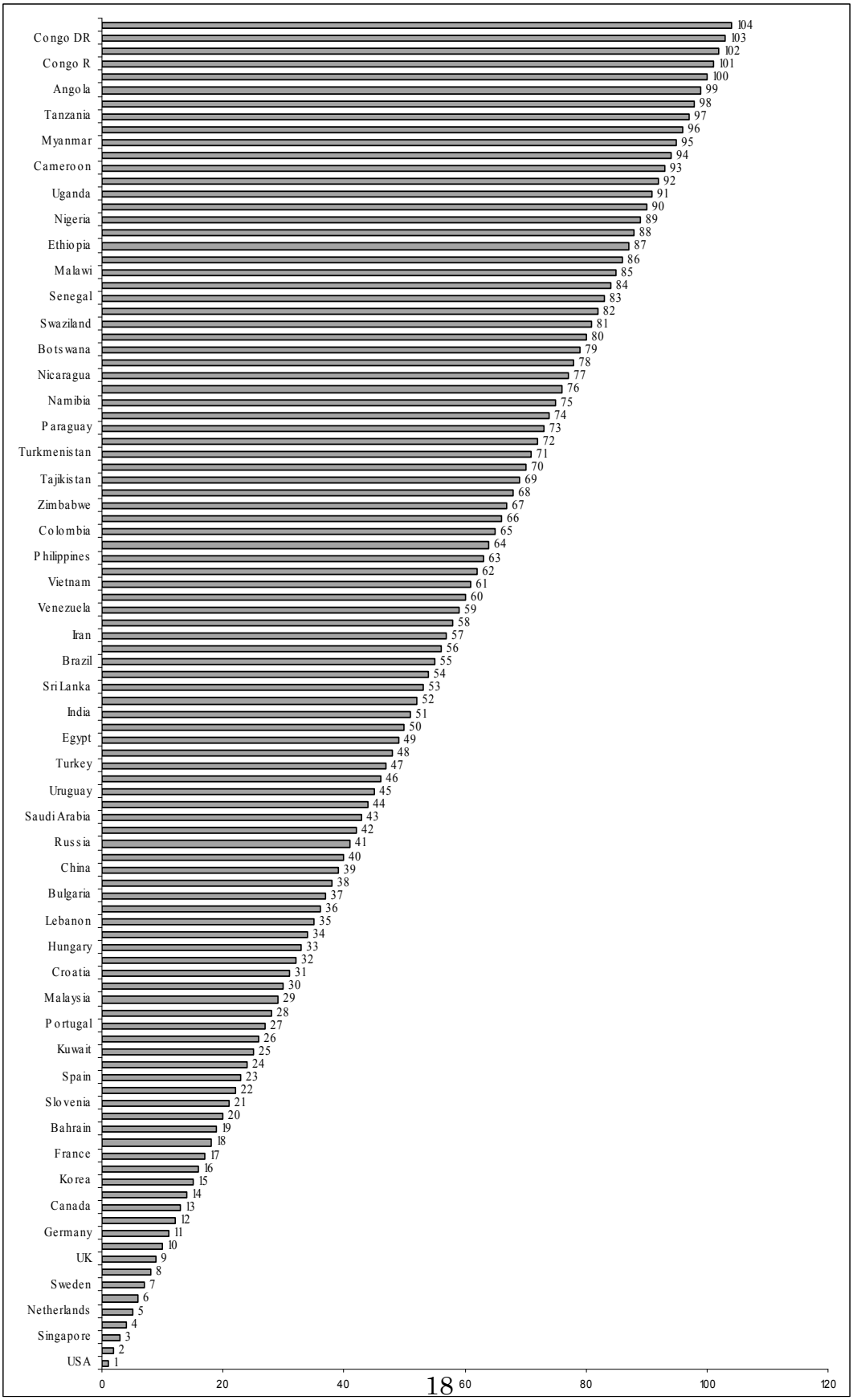
Indonesia	2.23	69	2.74	63	3.21	62
Philippines	1.53	76	2.58	65	2.95	63
Kyrgyz	3.28	51	2.60	64	2.95	64
Colombia	2.24	68	2.11	73	2.92	65
Pakistan	2.39	64	2.26	68	2.89	66
Zimbabwe	1.51	77	2.11	72	2.84	67
Ghana	2.31	67	2.84	60	2.76	68
Tajikistan	3.10	53	2.48	67	2.73	69
Uzbekistan	2.92	58	2.54	66	2.70	70
Turkmenistan	2.97	56	2.79	61	2.65	71
Syria	2.88	59	1.64	77	2.60	72
Paraguay	1.48	78	2.13	70	2.51	73
Bangladesh	1.83	73	2.12	71	2.50	74
Namibia	1.75	75	1.98	74	2.46	75
Peru	1.05	87	1.57	79	2.39	76
Nicaragua	1.79	74	2.23	69	2.35	77
Mongolia	2.05	70	0.95	88	2.29	78
Botswana	0.56	98	1.25	83	2.25	79
Bolivia	1.27	82	1.79	76	1.91	80
Swaziland	1.85	72	1.48	80	1.89	81
Sudan	0.93	91	0.91	89	1.76	82
Senegal	1.25	83	1.27	82	1.62	83
Kenya	1.31	79	1.07	86	1.43	84
Malawi	0.77	95	0.69	92	1.42	85
Nepal	1.29	81	1.37	81	1.38	86
Ethiopia	0.99	89	1.06	87	1.25	87
Zambia	1.93	71	1.60	78	1.24	88
Nigeria	0.75	96	0.52	97	1.24	89
Madagascar	1.30	80	1.14	85	1.19	90
Uganda	0.79	94	0.82	90	1.06	91
Lao PDR	0.55	99	1.19	84	0.87	92
Cameroon	1.00	88	0.64	94	0.79	93

Yemen, Rep.	1.23	85	0.59	96	0.77	94
Myanmar	0.97	90	0.79	91	0.76	95
Mozambique	0.62	97	0.63	95	0.73	96
Tanzania	1.25	84	0.41	99	0.63	97
Cambodia	0.45	100	0.66	93	0.55	98
Angola	1.20	86	0.13	104	0.52	99
Somalia	0.28	103	0.34	100	0.48	100
Congo, Rep.	0.89	93	0.49	98	0.47	101
Central African Republic	0.42	101	0.31	101	0.42	102
Congo, Dem. Rep.	0.40	102	0.14	103	0.26	103
Chad	0.27	104	0.25	102	0.21	104

Note: Arranged according to the ranks in 2005. EAS countries have been put in bold.

Source: Calculated by authors following the methodology described in the text.

Figure 1: Rank of Countries in Ascending Order in 2005



Third, among the 16 East Asian countries, 10 countries successfully enhanced their global ranks between 1991 and 2005, while the same of rest six countries decelerated (Table 2). Among those climbing the ladder in terms of attainment of infrastructure development, most impressive stride has been made by Vietnam that has jumped 31 places (from 92 to 61) over the period 1991 to 2005. Philippines, South Korea, China, Malaysia, and Lao PDR are the countries which have improved their ranks. Among those that have come down the ladder in terms of infrastructure development between 1991 and 2005 are countries like Australia and Brunei (rankings of both fallen by 9 places). Therefore, a regional integration process among the EAS countries should attempt to reduce the infrastructure gaps.

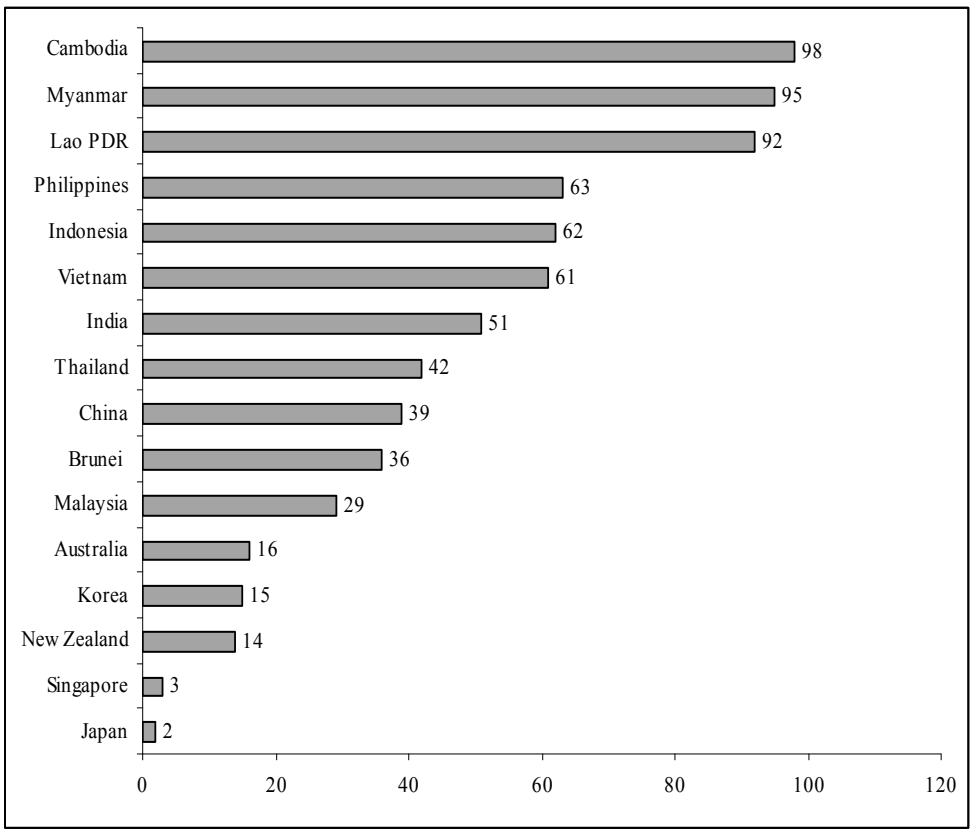
Fourth, the infrastructure gap between the most developed and the least developed in East Asia seems to have widened than narrowed from 5-100 in 1991 to 2-98 in 2005. The resource requirements for bridging these gaps are therefore substantial. The process of regional economic integration has to contribute to narrowing these gaps by providing resources for development of infrastructure.

Table 2: Evolving Global Ranks of East Asian Countries in Terms of Infrastructure Development

	1991	2000	2005
Japan	5	4	2
Singapore	6	2	3
New Zealand	13	12	14
Korea	26	15	15
Australia	7	16	16
Malaysia	37	27	29
Brunei	27	31	36
China	49	43	39
Thailand	43	38	42
India	50	49	51
Vietnam	92	75	61
Indonesia	69	63	62
Philippines	76	65	63
Lao PDR	99	84	92
Myanmar	90	91	95
Cambodia	100	93	98

Source: Authors based on Table 1.

Figure 2: Global Ranks of East Asian Countries in 2005



4. Narrowing the Infrastructure Gaps in East Asia

As observed above, the gap between the most developed and the least developed in East Asia in terms of the index has widened than narrowed during the period 1991 and 2005. The gaps existing between the EAS countries in terms of level of infrastructure attainment need to be addressed as a part of the programme of regional economic cooperation and integration for promoting balanced regional development. Otherwise, the programmes of regional cooperation could work to further widen the development gaps. In particular, enabling infrastructure needs to be created in the laggard regions and countries so that they can enjoy the opportunities created by regional trade liberalization

and integration. Therefore, Asia's growth potential will be realized only if we can narrow the infrastructure gap.

The resource requirement for bridging or narrowing these gaps is substantial. RIS (2007) estimated that developing Asia including LDCs will need to spend an estimated total of US$ 412 billion per annum between 2007 and 2012 (or about 7.3% of the combined GDP of developing Asia and LDCs) on infrastructure development such as roads, railways, airways, ports and electricity (see, Table 3). This figure does not include cross-border infrastructure. RIS also estimated that India alone has to spend an investment of about US$ 410 billion in six infrastructure sectors, namely, road, railways, ports, power, aviation, and urban infrastructure during the period 2007 to 2012 as against the estimated US$ 384 billion during 2007-2011 by the Planning Commission (Government of India, 2007). These estimates are also in tune with others, as summarized in Table 4.

Table 3: Annual Infrastructure Investment Needs in Developing Asia

Countries	Investment (2007-2012)	
	Amount (US$ billion)	Share in GDP (%)
China	208.33	10.78
India	68.33	9.89
Indonesia	26.67	6.46
Malaysia	13.33	7.87
Philippines	8.33	7.85
Thailand	11.67	7.22
Vietnam	6.67	5.80
Asian LDCs	74.67	4.60
Total	412.06	7.30

Source: RIS (2007)

Table 4: Estimates of Annual Infrastructure Investment Needs in Asia, 2007-2011

	ADB-JBIC-WB	UNESCAP	RIS
	East Asia excluding South Asia[1]	East Asia and South Asia[2]	South and East Asia[3]
Infrastructure investment (US$ billion)	165	228	412
Infrastructure investment (percent of GDP)	6.2	6.8	7.3

Notes: 1. Includes East Asia excluding South and Central Asia for the period 2006-2010.

2. Includes East Asia and Pacific, and South Asia for the period 2006-2010. 3. Includes Developing and LDCs in South, Southeast and East Asian countries for the period 2007 to 2011.

Source: RIS based on the respective studies.

It is clear that additional resource requirements for meeting infrastructure needs of Asia are at least US$ 200 billion per year. RIS study also goes on to demonstrate that mobilization of resources on that scale is feasible in the current conditions of Asia with large surplus savings (over US$ 300 billion in 2004) but they cannot be delivered in full because of a lack of an appropriate regional framework for their mobilization. Hence, these savings and excess foreign exchange reserves of Asia have to be deployed outside the region such as US treasury bonds often earning very poor if not negative real return. Asian countries are now setting up sovereign wealth funds to enhance their returns on these foreign exchange reserves. However, it has been argued by an RIS study that this can be done in a much more effective manner by a regional framework. RIS has proposed a regional mechanism that can borrow from Asian central banks for infrastructure development in a very creative manner to supplement and complement other existing facilities and resources (see, RIS 2007 for further details).

It would appear therefore that the EAS region has resources for meeting the growing resource requirements for infrastructure development and narrow the development gaps to produce win-win outcomes. Needless to mention, the demand impulses generated from financing of additional infrastructure development in poorer countries in the EAS region will add to the dynamism of the region. By generating additional demand impulses within the region such a mechanism might also assist in adjustment with the global imbalances by reducing the dependence of Asia on the West.

5. Concluding Remarks

In the foregoing an attempt has been made to examine the infrastructure attainment of EAS countries in a comparative global perspective with the help of an Infrastructure Index following a methodology developed in earlier RIS studies. In terms of relative ranks, some EAS countries, like Japan, Singapore, New Zealand and Australia find themselves ranked along with the industrialized western countries, others like Thailand, Philippines, China, India, Vietnam occupy middle space and the least developed countries like Myanmar, Lao PDR and Cambodia ranked towards the end of the sample. Some countries have improved their ranks over time while others have slipped down the ranks because of inadequate attention paid to infrastructure development. This RIS Infrastructure Index reveals very wide gaps in terms of infrastructure attainment across the EAS region, which seems to have widened rather than narrowed over time. Hence, infrastructure development in the lagging regions needs to be paid due attention if the regional inequalities are not to widen further. In order to bridge the infrastructure deficits across the region, huge magnitude of resources would be needed which are estimated to be between US$ 200 to 500 billion per year. On the other hand, the region's foreign exchange reserves now add up to more than US$ 3 trillion, far in excess of their Balance of Payment liquidity needs and that remain invested in western securities earning negative rates of return in the absence of a regional framework for their fruitful deployment. In that context, an RIS proposal of a regional mechanism to mobilize a

very small proportion of these reserves for development of regional cross-border connectivity and other infrastructure could be highly productive. It might also assist in generation of new demand within the region and help in adjustment with global imbalances. This proposal needs to be examined further by the EAS policy makers including the modalities for operationalizing the regional mechanism through exiting regional institutions or by creating a new one.

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Chapter 2: Infrastructure Development in Cambodia

Dr. SUM Map

Abstract

It is generally believed that the backbone of any sustainable development is physical infrastructure: roads and bridges, railways, ports and inland waterways, airports, electricity generation and network, irrigation, telecommunications, etc. The improvements in infrastructure will have a positive impact on both economic and social development, including education, health, tourism, and trade, as well as on a nation's integration with the region and the world. Cambodia still lacks physical infrastructure to promote such social and economic development.

This report's main objective, therefore, is to present the current status of Cambodia's infrastructure, its strategy and plan for infrastructure development, the emerging issues and policy recommendations for infrastructure development.

1. INTRODUCTION

Cambodia covers 181,035 square kilometers, which is divided into three topographic regions: the Central Plain Region, Mountainous Region, and Coastal Region. These regions comprise about 51 percent, 39 percent, and 10 percent, respectively, of Cambodia's total area. Cambodia has made considerable progress in the one-and-a-half decades since the Paris Peace Accords of 1991. That event marked the beginning of a transition from conflict to peace, bringing most of the parties involved in the

low-intensity civil war of the 1980s to agree to compete for power through elections rather than through military struggle. This agreement also cleared the way for international recognition, inflow of foreign investment and development assistance, and transition from an isolated, subsistence-oriented economy to one based on international integration and markets. As a result, high economic growth and improved national living standards were realized. For instance, the economic performance in 2006 was robust, with sustained growth rate due to actions taken by the Royal Government of Cambodia (RGC) to support agricultural production and the garment sector. Economic growth was 10.4 percent in 2006, compared to 13.4 percent in 2005, reflecting the 4.4 percent expansion of agricultural production and the rebound of industrial and service sectors, which increased by 17 percent and 11.4 percent, respectively.

Infrastructure is a broad concept linked to every facet of the economy and human life. One aspect of infrastructure development is to build new assets and maintain the existing ones; another is to deliver infrastructure services. Transport, telecommunications, energy, and water have become part and parcel of human existence. These are central to the household life and economic production. It is difficult to imagine a modern world without them.

A lack of such infrastructure facilities is considered to be a major structural weakness that holds back economic growth and development. It is often said that infrastructure can be considered as the “wheels” of economic growth. Furthermore, infrastructure also helps to spread the benefits of growth, which makes the development process more inclusive. Economic growth brings economic development, but the “inclusiveness” of

development is an important issue for policymakers. There is no guarantee that the benefits of economic growth are shared by all, which consequently could have reduced poverty.

While economic growth is a necessary condition for poverty reduction, it is not sufficient. Here, infrastructure plays a dual role: It supports higher economic growth and strengthens the sharing of the benefits of growth. Cambodia generally has less developed infrastructure than its neighboring countries due to the destruction brought during the long civil war and to the lack of maintenance since then. This is a serious obstacle to the socio-economic growth of this country as physical infrastructure is important for realizing both sustainable economic growth and poverty reduction.

2. CURRENT STATUS OF INFRASTRUCTURE DEVELOPMENT

2.1. Roads

In Cambodia, road transport accounts for an overwhelming share of the total transported volume of passengers (65 %) and freight (70 %). Only about 20 percent of the roads and highways are covered with asphalt and in passable condition; about 50 percent of the roads are made of crushed stone, gravel, or improved earth; and the remaining 30 percent are unimproved earth or little more than tracks. The existing Cambodian road network system consists of:

(1) National Roads: One-digit national roads have a total length of 2,052 kilometers, and two-digit national roads have a total length of 2,643 kilometers, respectively representing 7 percent and 9 percent of the total roads in Cambodia.

(2) Provincial Road: This is labeled as three- and four-digit national roads and has a total length of 6,615 kilometers, representing 22 percent of the total roads.

(3) Rural or Tertiary Road: This has a total length of about 18,948 kilometers and is 62 percent of the total roads.

By comparison, Cambodia's infrastructure access and stock are among the weakest in the ASEAN (See Table 1).

Table 1: Infrastructure Access and Stocks

	Water supply Access[1]	Sanitation Access[2]	Electricity Access[3]	Telepohe Access[4]	Internet Access[5]
Malaysia	93	--	97	62	34.4
Thailand	93	98	84	50	11.1
Philippines	86	83	79	31	4.4
China	76	39	99	42	6.3
Indonesia	78	55	55	13	3.8
Vietnam	49	25	81	9	4.3
Cambodia	44	22	17	4	0.2
Lao PDR	58	30	41	3	0.3

Source:ADB, JBIC, WB,(2005), Connecting East Asia: A New Framework for Infrastructure.

Note: 1. Percentage of population with access to at least 20 liters per person per day from "improved" water supply from a source within one liko meter from the user's dwelling

2. Percentage of population with excreta disposal system "under improved" sanitation technologies; "adequate" if it is private or shared (but not public) and if hygienically separates from human contact

3. Percentage of households with electricity access through commercially sold electricity, both on-grid and off-grid

4. Telephone subscribers per 100 inhabitants

5. Number of users per 100 inhabitants

2.2. Road Network Coverage

The road network is the lifeline of Cambodia's development and covers all major regions in the country. However, Cambodia remains to have unpaved sections and temporary bridges. Its coverage is as follows:

- The one-digit national road links Phnom Penh to major provincial centers except eight provinces connected by two-digit national roads with fair to poor condition. Two international airports can be accessed via one-digit national roads while eight national airports can be reached via the one-and two-digit national roads.
- District centers are accessed by provincial roads but 98.3 percent have either laterite or earth pavement.
- Access to commune and villages are via rural roads. Majority of rural road conditions vary from poor to very poor.
- Crossing major rivers is made possible via three bridges only (Mekong, Tonle Sap and Bassac Rivers). Other crossings are supplemented by ferry services.
- Although access to industrial, tourism, agricultural, and residential areas are via one-digit national roads to three-digit roads, the conditions of roads vary from good (1-digit) to poor and very poor (2-digit/3-digit).

Table 2: Transport Networks

	Road network (km per 100 km^2)	Percentage of paved road	Rail network (km per 100 km^2)
Malaysia	20	76	0.49
Thailand	12	97	0.79
Philippines	68	22	0.16
China	19	91	0.64
Indonesia	20	58	0.25
Vietnam	29	25	0.97
Cambodia	22	4	0.42
Lao PDR	14	15	0

Source: ADB, JBIC, WB, (2005). *Connecting East Asia: A New Framework for Infrastructure*.

2.3. Current Road Conditions

According to the report of the Japan International Cooperation Agency (JICA) released in 2006, only 7.4 percent of the total road network (30,258 km) are paved, most of which belonging to the one-digit national road and some to the two-digit National Roads. About 80.1 percent of the two-digit roads are unpaved while 98.4 percent of the provincial roads are unpaved. Practically almost all rural roads are unpaved at 99.7 percent. These unpaved rural roads are covered with earth or laterite and, in most cases, are hardly accessible or totally unpassable during the rainy season, which often leads some parts of the country to remain isolated as well as to face economic disruption. A study showed that, in 2005, about 15 percent of the rural population (compared to 20%

in 2002) lives more than 5 kilometers away from a year-round accessible road. In the same year, about 11 percent of the rural population needs to travel for more than 30 minutes by motorbike to reach the nearest year-round road.[1] As a result, these people often become secluded during the rainy season, and the lack of access to market and public services poses a major constraint. In 2006, according to the Annual Progress Report 2006 National Strategic Development Plan, NSDP (2006-2010), 92 rural roads with the length of 264 kilometers were constructed; 44 roads of 707 kilometers were repaired; and 118 roads of 822 kilometers were maintained.

As of July 2005, 76 percent of one-digit road projects were completed while 10.2 percent were ongoing, and 13.8 percent were under tender. However, two-digit road conditions vary from good to poor, with 60 percent of the road in poor and very poor condition. Moreover, three-digit road conditions vary from fair to very poor with more than 90 percent in poor to very poor condition. The width of the road network in Cambodia is still in a concern. For example, 19 percent of the two-digit roads are a narrow 4.5m in width while 62.3 percent have widths insufficient for two-lane traffic. Moreover, 33 percent of the three-digit roads are less than 4.5m wide while 85 percent have widths insufficient for two-lane traffic.

2.4. Current Bridge Condition

All along one-digit national roads, 26 bridges (608m) or 4.4 percent of the bridges are

[1] Kov Phyrum (2007), "Rural infrastructure development", *Economic Review*, Vol. 4, No. 1, Economic Institute of Cambodia (EIC), Cambodia, p. 12.

still temporary bridges and will need replacement by permanent bridges. Moreover, 31 permanent bridges (602m) that are narrow (less than 7m wide) will be widened or replaced to satisfy Cambodian standard requirements for bridges. As to the conditions of permanent bridges along these national roads, 86.9 percent are classified as good and 13.1 percent as fair (JICA 2006).

The improvement of one-digit road bridges covers 57 bridges, which are temporary and narrow bridges, with a total length of 1,210m.

For the two-digit national roads, new bridges have to be built in 107 locations while 17 historical bridges need to be replaced (new alignment) with permanent bridges. Additionally, 392 (50.1%) bridges along these two-digit national roads still need to be changed into permanent bridges. Existing permanent bridge conditions vary from good to poor, with more than half of the bridges in good condition. Around 655 two-digit road bridges (temporary, historical, nonexistent bridges and narrow bridges) that need to be improved have a total length of 11,785m.

Along provincial roads, more than half of the provincial bridges (618 bridges or 54.5%) are temporary while three locations need new bridges. About 10 bridges are in collapsed state while the permanent bridge conditions vary from good to poor, with 71.2 percent in good condition. In addition, about 207 bridges along three-digit roads will be improved. These total about 4,372m. For those along rural roads, 70 small rural bridges and 160 culverts were built in 2006.

2.5. Recent development of international highway route

The Cambodian Asian Highway (AH) intersection is located in the middle of Southeast Asia (AH1), connecting to two mega cities (Bangkok and Ho Chi Minh) in the north as well as connecting Sihanoukville Port to Lao PDR in the southern part of the North-South Economic Corridor (AH11). Some of the one-digit national roads are part of the international/regional highway network.

Table 3: 1 Digit National Roads.

Route No.	**Length (Km)**
AH1 (NR.1, NR.5)	572.4
AH11 (NR.4, NR.6, NR.7)	755
AH123 (NR.48, NR.3, NR.33)	163.3
GMS route (NR.66, NR.78)	464.9
Total	1,955.60

2.6. Railways

Cambodia has two rail lines, both originating in Phnom Penh and totaling about 650 kilometers of single railway tracks (i.e., one-meter-gauge track). Between 1929 and 1942, the French built the first line (Northern line), which runs from Phnom Penh to Poipet on the Thailand/Cambodia border via Battambang. Assistance from France, West Germany, and China in the late 1960s, supported the construction of the second line

(Southern line), which runs from Phnom Penh to Sihanoukville port.

A 1997 study of the Royal Railways of Cambodia (RRC) established that the condition of the Northern line was very poor and serious. The Northern line runs through rich agricultural areas that are poorly served by the road network and potentially connects with the Thai railway system, becoming part of the proposed Trans Asian Railway that links the ASEAN subregion with China. The Southern track is in reasonable condition, but the formation is poor and 70 percent of sleepers need a replacement. Rolling stock is old and inadequately maintained, with only 13 diesel locomotives, seven diesel shunting locomotives, and one rail car in service. Railway transport accounted for only 20 percent of passengers (persons/km) and 10 percent of goods (tons/km), but plans are underway to make this infrastructure more useful and productive(Royal Government of Cambodia 2007). In 2005, the railway transported 268,000 tons of freight, down 9.8 percent compared to 297,000 tons of freight in 2004. A total of 350 tons of luggage was transported in 2005, down 33.1 percent compared to 523 tons in 2004. The number of passengers transported by rail was 47,000, down 42.0 percent compared to 81,000 passengers in 2004 (NIS 2007).

2.7. Ports and Inland Waterways

Cambodia has two major international ports (at Phnom Penh and Sihanoukville), two coastal ports (at Kampot and Koh Kong), and other river ports at Kampong Cham, Kratie, Stung Treng, Kampong Chhnang as well as Siem Reap in the Tonle Sap. Cambodia has also long navigable inland waterways. Phnom Penh, located at the junction of the Bassac, the Mekong, and the Tonle Sab rivers, is the only river port capable of receiving nearly

800,000-ton ships during the wet season and 500,000-ton ships during the dry season. The Phnom Penh port remains an important port for international commerce as well as for domestic communications. A total of 1,186 ship movements were recorded in 2005, an increase of 8.4 percent compared to 1,094 ship movements in 2004. Of these movements, international shipping accounted for 77.4 percent, and local shipping has 22.6 percent of ship movements. A total of 742,883 tons of cargo were shipped through The Phnom Penh port in 2005, an increase of 23.4 percent compared to 601,971 tons in 2004. International cargo accounted for 93 percent of these shipped cargoes and domestic cargo, of only 0.7 percent (NIS 2007).

The second major international port is the Sihanoukville sea port. It is located on the Gulf of Thailand, 200 kilometers from the capital. There were 1,104 ship movements for Sihanoukville International Port in 2005, up 7.4 percent compared to 944 ship movements in 2004. A total of 4,318,151 tons of general cargo were shipped in 2005, an increase of 3.4 percent compared to those in 2004. The number of containers (TEU) shipped in 2005 was 215,198, up 8.9 percent compared to 197,613 containers (TEU) in 2004. Imports accounted for 107,624 containers (TEU), a hike by 8.9 percent compared to 98,830 containers (TEU) in 2004. Exports accounted for 107,574 containers (TEU), also higher by 8.9 percent compared to 987,784 containers (TEU) in 2004.

Except for the Phnom Penh and Sihanoukville ports, others are equipped only with small pontoons and simple piers at most. Riverbanks are used for loading and unloading at many of these ports.

Inland waterways were important historically in domestic trade in Cambodia. The Mekong and the Tonle Sab rivers and their numerous tributaries, and the Tonle Sab provided avenues of considerable length, including 3,700 kilometers navigable all year by craft drawing 0.6 meters, and another 282 kilometers navigable to craft drawing 1.8 meters. In some areas, especially the west of the Mekong River and north of the Tonle Sab River, villages were completely dependent on waterways for communications. Based on the 2006 annual progress report on the NSDP (2006-2010), waterway transport accounted for only 15 percent of passengers (persons/km) and 20 percent of goods (tons/km), although the total volume of goods handled at the two international ports was 2.6 million tons in 2006, an increase by 15 percent compared to that in 2005.

2.8. Airports and Aviation

At present, Cambodia has 10 airports, including the Phnom Penh International Airport near Phnom Penh and the largest one, and Siem Reap Airport, the gateway to Angkor Wat. These two major airports serve international flights. Phnom Penh International Airport currently handles nonstop international flights to nine destinations in eight countries/regions and has a 3,000-meter runway. However, the limited facilities make it impossible for large aircrafts to land. Thus, improvements on the facilities of the Phnom Penh International Airport is being contracted on a build-operate-transfer (BOT) scheme through a joint enterprise between French and Malaysian corporations.

Siem Reap Airport has a 2,500-meter runway and is used by domestic flights. Airline services connect Siem Reap with Bangkok. With assistance from the Asian Development Bank (ADB), airport facilities, including lights, have been improved.

In 2002, the remaining airports in Cambodia attracted less development. Battambang Airport and Sihanoukville Airport had surface-dressed runways, although not in good condition; others only had dirt airstrips. However, in 2006, eight domestic airports were repaired and maintained, especially their major parts such as runway, parking, and markings on the airport boundary. Two more foreign airlines started offering flights to Cambodia that year. In fact, international flights increased by 13 percent compared to that in 2005 (Royal Government of Cambodia 2007). According to the Open Air Policy of the Cambodian government, the number of airlines flying into Cambodia has been steadily increasing in recent years.

2.9. Telecommunications

Cambodia has been lagging far behind virtually every country in the world in terms of telecommunication capacity. When the civil war ended, there were only 3,000 telephone lines in Phnom Penh. Only short-wave radio with a limited capacity connected these lines with provincial cities. By 2006, there was a 33.67-percent increase in telephones in use compared to that in 2005. The year before that saw an increase of 28.9 percent. Mobile phones in 2005, meanwhile, totaled 840,916 units (or 95.3 percent) compared to 644,389 units (94.2 percent) in 2004. Note too that the number of units in use per 100 persons increased from year to year (6.4 units in 2005 and 7.98 in 2006). As a result, the telecommunication network expanded along with the increase in the number of telephone users (both mobile and fixed phones).

Cambodia's postal services used to be unreliable, but had recently been expanded and earning back the public's confidence. So with the country's national TV transmitter,

which has been upgraded. In 2006, the coverage, efficiency, and quality of government mass media (radio, TV, and press agency) were expanded and improved. About 70 percent of its people were able to receive news, education, and entertainment through the existing mass media, both government and private.

2.10. Internet Services

Currently, there are seven internet service providers (ISPs), namely, Camnet, Bigpond (CogeTel), Open Forum, CaminTel, Telesurf, Camshin, and Casacom. Broadband internet services are now being provided through ADSL wireless service or optic fiber in Phnom Penh. Expansion has occurred especially in rural areas of 24 provinces/municipalities, where more people are gaining access to e-mails and the internet. However, the cost of telecommunications remains high and burdens the entire population as well as businesses in Cambodia.

2.11. Electricity

The power sector was severely damaged by war and neglect from 1975 until 1995. It is currently in the process of recovery, thanks to the support of multilateral and bilateral agencies.

Electricity is generated and/or distributed by the following entities: Electricité Du Cambodge (EDC), private entities including independent power producers (IPPs) in provincial towns, licensees in smaller towns, and rural electricity enterprises (REE) in rural areas. The EDC, a state-owned enterprise established in 1996, has a consolidated

license (i.e., generation, distribution and transmission) for electricity supply in major cities and provinces, and provided 26.5 percent of Cambodia's total electricity supply in 2005. On the other hand, 71.1 percent of electricity supply was provided by IPPs, and 2.4 percent by 100 consolidated licensees. In 2006, electricity generation rose by 20 percent, i.e., increasing from 894.52 Gwh in 2005 to 1,073.28 Gwh in 2006. Electricity imported from Thailand and Vietnam also increased by around 20 percent and 60 percent, respectively.

Notwithstanding the progress made, the RGC recognizes that the high cost (the weighted average production cost of electricity is US$0.15 per kWh compared to only US$0.03 to US$0.05 per KWh in the neighboring countries, (Kov Phyrum and Hean Menghong 2007), unreliability, and limited geographic availability of electricity constitute a major hindrance to private sector and rural development. Such high cost of electricity reflects the almost total dependence on imported oil-based fuel as the primary energy source (92% in Cambodia compared to 3% in Lao PDR, 2% in Thailand and 12% in Vietnam) [Kov Phyrum and Hean Menghong 2007], and the lack of a high voltage transmission system. Inefficient provision of electricity is an issue, particularly in rural areas. According to Kov Phyrum (2007), there are at present only 8.6 percent of rural households (equivalent to nearly 200,000 households) with access to electricity, while the rest use other traditional sources of energy such as kerosene and batteries for lighting. It is important to note that the average electricity's price in rural areas is about US$ 0.75 per KWh compared to around US$ 0.20 in urban areas.

For the whole country, the electrification rate is far below the rates of neighboring countries---i.e., less than 17 percent of Cambodian households can access electricity.

This pales when compared with the 84 percent in Thailand, 81 percent in Vietnam and 41 percent in Lao PDR. Such limited access to electricity impedes Cambodians from accessing new technology, diversifying economic activities, increasing agricultural production, and improving living conditions.

2.12. Irrigation System

Irrigation plays a key role in the efforts to attain food self-sufficiency and food security, which are part of the overall national goal of poverty reduction through socio-economic development. In 2005, only 16 percent of rural households have their paddy fields irrigated; the rest have their farmland relying upon rainwater(Kov Phyrum 2007). Consequently, these farmers often experience low production yields and earn lower incomes for their family, forcing them to remain trapped in poverty. Nevertheless, in 2006, many of the existing irrigation and drainage systems, particularly in high poverty incidence areas and along the border areas, were rehabilitated and reconstructed, with irrigating capacity for 89,211 hectares (75,101 hectares for wet-season rice cultivation and 14,110 hectares for dry-season rice cultivation) [Royal Government of Cambodia 2007].

3. INFRASTRUCTURE DEVELOPMENT PLAN IN CAMBODIA

To ensure the efficiency and sustainability of socio-economic development and poverty reduction, the RGC's key national strategic policy frameworks focus on the governance action plan and on the quality of people's life. The RGC has prepared two development guidelines in the past---the Socio-Economic Development Plan II 2001-2005 (SEDP),

and the National Poverty Reduction Strategy 2003-2005 (NPRS)---and a new five-year national development plan, the National Strategic Development Plan (2006-2010) (NSDP), which was enforced starting January 2006. It should be noted that its policy has shifted from "rehabilitation" to "economic development"[2], which meant Cambodia is now at the stage of growth where it is aligning all development participants, both domestically and internationally. Aside from national economic development, poverty reduction is another of the country's major focus. Poverty, especially in the rural areas, is much more serious.

The SEDP II notes that infrastructure too is a key area that needs to be developed as it can have a multiplier effect on pro-poor, rural-based growth sectors, through supply side adaptation (transport, electricity, telecommunication, water supply, etc.). As for NSDP (2006-2010), its goals and targets would be operationalized and implemented through the Rectangular Strategy (RS). The RS, which involves growth, employment, equity and efficiency, provides a clear and focused framework that can drive the country toward the needed socio-economic development. The RS promotes, at its core, Good Governance as it pursues progress in various priority areas under its "growth rectangles". Infrastructure is one of its Rectangular Strategy's Growth Rectangles (2003-2008). The Rectangle covers: (a) further construction of transport infrastructure; (b) management of water resources and irrigation; (c) development of energy sector and

[2] The nation is in the process of rehabilitation of internal turmoil to development in peace. Therefore, the road network development in Cambodia has to proceed in order to realize sustainable and stable socio-economic development with poverty alleviation of the people and stabilization of daily life, especially in rural areas, as a nation located in the global center of the Greater Mekong Region.

electricity network; and (d) development of information and communications technology.[3] The RGC does realize that the backbone to any sustainable development is physical infrastructure.

The following section presents the physical infrastructure development plans and investment needs in Cambodia---plans that are meant to fill the current infrastructure requirements earlier identified in this study.

3.1. Roads

Transportation networks and facilities that connect all corners of the country are the arteries that can transform the country into an integrated economy and are critical for distributed economic growth. The Road Master Plan has three main objectives. The first objective is to rehabilitate and reconstruct the main national roads, thereby improving land transport throughout the nation. The second is to build road links to neighboring countries, thereby opening up some of the more remote areas of the country to international trade and tourism. The last one is to develop a sustainable road maintenance program, thereby assuring that investment in road rehabilitation and reconstruction generates sustainable benefits.

Much has been done to rehabilitate all types of roads, which form part of the ASEAN road network. The priorities for the NSDP period are (Royal Government of Cambodia

[3] The Rectangular Strategy consists of 4 rectangles: 1) Enhancement of Agricultural Sector; 2) Rehabilitation and Construction of Physical Infrastructure; 3) Private Sector Development and Employment Generation; and Capacity Building and Human Resource Development.

2006):

- Finalize and enact a Road Law to resolve the lack of systematic, unified planning and budgetary process, and to clearly delineate roles and responsibilities of respective government ministries and agencies for road rehabilitation and maintenance;
- Prioritize, rehabilitate and reconstruct as many roads as possible;
- Accord priority to remote communes or villages; expand the rural road networks to ensure that all communes have easy access to district headquarters and to national primary and secondary road networks;
- Address in a humane manner resettlement issues of people affected by road construction works;
- Ensure the maintenance of all roads is properly prioritized, bearing in mind that once a road is improved, increased traffic causes damage, thereby needing better and more frequent maintenance of the road;
- Use as much as possible, especially for rural road construction and maintenance, labor-intensive measures to increase rural incomes;
- Engage private sector on BOT schemes and other means of constructing and maintaining roads and bridges where cost could be recovered by tolls.

3.2. Road condition problems

The country's road condition is poor: Only 19.3 percent of the 11,310-kilometer national and provincial roads are paved, while 80.7 percent are earth, gravel or laterite roads. More than 60 percent of two-digit national roads and more than 90 percent of

the provincial roads are of poor to very poor conditions. Many roads are so narrow; some sections of one-digit road are in need of motorbike lanes; two-digit (62% less than 6.5m wide) and provincial (85% less than 6.5m wide) roads need to be widened to accommodate two-lanes of sufficient width.

Many roads are to be upgraded to international class. Plans include upgrading NR.1, 5, 4, 6, 7 to Asian/ASEAN class and enhancing NR.48, 3, 33, and NR.66, 78 to ASEAN/GMS class. These are aligned with the government's priority on further expanding trade, particularly within ASEAN, and on improving cross border linkage. The budget will be used to the maximum extent possible to finance the local cost of domestic roads and railway programs, either alone or with the support of international agencies. The reconstruction of NR.6 aims to link Siem Reap and Angkor Wat temples to Phnom Penh and Poipet/Cambodia-Thai border. This plan is anticipated to open and facilitate increased tourist traffic. The upgrade of NR.1 and 5 will constitute the first phase of the Ho Chi Minh-Phnom Penh-Bangkok Road through Cambodia. The NR.7 will be rehabilitated to link southern Laos with Phnom Penh and Sihanoukville via NR.4. Meanwhile, R. 48 will be rehabilitated to link Sihanoukville, the trade-industrial zone of the country, to the Bangkok port and the other main international ports in the region so as to facilitate the traffic of goods, particularly for regional trade. The rehabilitation of national roads in Ratanakiri and Mundulkiri Provinces will allow transport of goods and people across the border and beyond, and improve tourism arising from opportunities provided by the bilateral, triangle socio-economic cooperation area and Greater Mekong Subregion (GMS).

Meanwhile, roads along flood plains have insufficient slope protection. Temporary bridges will have to be replaced by permanent bridges; additional bridges need to be constructed where none exists; and roads with historical bridges need to be realigned. Some permanent narrow bridges have to be widened to accommodate the increasing number of vehicles and motorbikes in Cambodia each year.

3.3. Road Network Problems

There are still insufficient bridges crossing major rivers, and additional bridges are necessary along other rivers. Roads that are in very poor state or practically inadequate or unsafe should be reconstructed. In addition, there is a need to increase the pavement ratio for two-digit and provincial roads. Bypasses will also have to be built to serve through traffic along built-up/congested areas. Road section areas prone to flood damage (i.e., along Mekong, Tonle Sap and Bassac Rivers) will need improvement on slope protection and embankment stability.

3.4. Railways

The railway network has long been a vital but much damaged and grossly under-utilized asset. An immediate priority of the government is to prepare performance standards and a regulatory framework that aims to facilitate the expansion of private investment throughout the transport sector. The southern railway line between Phnom Penh and Sihanoukville port requires rehabilitation to reduce excessive operating costs. The aim here is for the railway to handle higher volumes of cargo traffic from the port at competitive freight rates compared to road transport rates.

The RRC Strategic Plan also lists five policy objectives: (1) continued rehabilitation of physical infrastructure; (2) increased income generation in an attempt to support rail operations; (3) promotion of competition with other transport modes in the context of a market economy; (4) promotion of other new rail services and increased connections with major points such as dry ports so as to transport containers and petroleum; and (5) construction of a 255 kilometers link between Phnom Penh and Lock Ninh (Vietnam) that would integrate the Cambodian railway into the regional railway system (Singapore-Kunnming rail link).

Railways in Cambodia are expected to be part of the Asian Railway Network through linkage with the railway network in Thailand and Vietnam. To this end, it is necessary to link Sisophon with Poipet, and Phnom Penh with the Vietnam/Cambodia border. According to a Loan Agreement (GMS Rehabilitation of the Railway in Cambodia) between the Kingdom of Cambodia and ADB dated on March 5th, 2007, the ongoing project's objective is to facilitate subregional trade and economic growth in Cambodia by providing a cost-effective and efficient railway transport. The railway link through Cambodia is also an integral part of the GMS southern economic corridor, which is one of 11 flagship programs under the GMS subregional economic cooperation.

3.5. Ports and inland waterways

Almost all bulk imports and exports of the country are handled by two ports: the Sihanoukville deep sea port and Phnom Penh inland river port, which is capable of receiving ships of limited tonnage capacity. Investment priorities for ports and inland waterways transport include rehabilitation of dredgers to allow for the regular dredging

of all major waterways; and the rehabilitation and expansion of Sihanoukville deep water sea port, wherein a master plan was completed and the project implementation is currently being prepared with financial support from the government of Japan. Further upgrade of the Phnom Penh inland river port, improvement of smaller domestic river and lake ports, and upgrade of the existing ferries are also priorities.

Other plans include the establishment of national port policies and creation of maintenance organizations for waterways and ports. In addition, the government aims to develop and maintain the port facilities and to improve the Sihanoukville Port by constructing a new cargo wharf; expanding the container wharf; building a container yard and container cranes supply; and improving the roads, power supply, and lighting system in the port area.

3.6. Airports and aviation

The availability of Civil Aviation services is a prerequisite for tourism since it has a significant multiplier effect on the economy. Therefore, the Phnom Penh and Kang Keng International airports will be further improved under the existing BOT agreement. Cambodia needs to expedite the ongoing BOT project to accommodate large airplanes. Siem Reap international airport also needs an upgrade. Of the domestic airports, some need to be brought to higher standards so as to increase the passenger flow to remote areas with high tourism potential.

Cambodia is now developing telecommunication networks, paving the way for improved communications in the air traffic control system, covering both the airspace

over the airport and the air routes, including building-relevant facilities. The government will explore various avenues for financing these endeavors, particularly through BOT arrangements involving the private sector.

3.7. Telecommunications

The long-term development vision is to develop a cost-efficient and world-class post and telecommunication system, incorporating advanced information technology and focusing on modernization efforts and nationwide coverage. This vision requires huge investments to build the backbone infrastructure of the telecommunications systems, especially high-speed optical fiber cables for the development of rural telecommunications systems. The priorities of the RGC in the NSDP (2006-2010) are (1) to bring down rapidly the present high cost of telecommunications; (2) to expand the telecommunication network in urban areas and extend them to smaller cities and rural areas; (3) to expand postal services from cities and urban areas, to rural areas and provide quality, reasonably price services while strengthening the capacity of responsible institutions; (4) to expand the coverage and improve the efficiency and quality of government mass media (radio, TV and press agency); and (5) to continue to follow an open policy in promoting a high level of private sector participation.

The Ministry of Post and Telecommunication (MPTC) is in the process of further developing its infrastructure as well. In some subsectors, the private sector also has an important role in such areas as mobile phones and the internet.

In its current situation, the telecommunication sector should be backed by an

appropriate regulatory and supervisory system. It is necessary to develop transparent and fair rules such as those for entry into business and for tariff setting. In this regard, the organizational framework should specify separate regulatory and operational bodies, as such would allow the formulation of rules to proceed smoothly.

In electronic communications, there have been various attempts to develop a Khmer font, but until recently the different systems have been incompatible---i.e., to read and write electronic messages in Khmer, both sender and recipient must use the same font system.

3.8. Electric power generation

As earlier noted, Cambodia's development is partly hampered by high electricity rates when compared to its neighboring countries and by unstable electricity supply. The country needs an overall electricity supply plan. When drafting such, its government should not only look at generating thermal, hydro or mini hydro power for rural areas; it should also consider potential purchase from neighboring countries. The plan would need to be based on a realistic demand estimate for both urban and rural areas and take into consideration existing master plans and studies already conducted by various donors.

The state-run utility EDC anticipates a significant increase in overall power demand. Although the demand in the provinces is extremely low compared with that in Phnom Penh, there is still a need to consider electrification in the provinces, including the use of energy locally available, as improving the living standards in rural areas and boosting

agricultural production are crucial for the country's development.

Moreover, any situation where public facilities constructed via the Official Development Assistance (ODA) but could not be fully utilized due to the existence of unfavorable contracts or constraints imposed by IPPs should be avoided and rectified. Fairness and transparency are requisites when granting concessions, and all information on IPP activities that could affect any ODA project must be disclosed.

3.9. Irrigation system

Investments in irrigations are indispensable to the livelihood of an overwhelming 80 percent of the rural households whose primary sector of employment is agriculture. Agricultural production in Cambodia is still carried out under unstable conditions due to an almost complete dependence on natural conditions, especially rainfall. To sustain and stabilize agricultural production---which should be Cambodia's principal engine for poverty reduction and economic growth---the rehabilitation and construction of irrigation systems and supporting maintenance system are critical. Compared to other infrastructure such as roads, irrigation systems will never be usable without its proper operation and maintenance. Thus, it is important to put in place a nationally-funded, well-programmed and systematic maintenance of the facilities, where there is clear sharing of responsibilities among central and local governments, and water users. The action plan of the Ministry of Water Resources and Meteorology is, in fact, to improve the inventory of the existing irrigation systems; to rehabilitate the drainage and flood protection systems; to rehabilitate the existing irrigation systems and pumping stations, particularly in high

poverty incidence areas and along the border areas; and to create Farmer Water User Communities for all irrigation systems that have been completed.

4. ISSUES OF INFRASTRUCTURE DEVELOPMENT

In the development of infrastructure in Cambodia, there are some important issues to be addressed.

4.1. Resources

At present, the Royal Government does not yet have the sufficient financial, technical, and human resources necessary for infrastructure development. According to a study report by the World Bank, the benchmark value of road investment as a ratio of the magnitude of the national economy in developing countries is set at 3.5 percent of GDP, whilst that in Cambodia is presently at a minimal 2.4 percent of her GDP. Cambodia, therefore, requires and welcomes private participation in infrastructure (PPI), because this offers benefits to Cambodia in the financing, construction, operations, and management of infrastructure.

Regional cooperation can also help finance the development of infrastructural assets in Cambodia. In the Asian and Pacific region, cooperation in developing infrastructure has followed a two-track approach: On one hand, there has been cooperation in building cross-border infrastructure that exploits shared resources (such as energy and water), harmonizing cross-border rules and regulations, and learning from good institutional practices and policies. On the other hand, there has been cooperation in financing

infrastructure development.

4.2. Maintenance

Road maintenance is crucial as it impacts both economic development and even public safety. For instance, the lack of road signs creates problems such as road accidents, waste of the public's travel time, and even a waste of the national budget that should have been used to build new roads.

The financial framework for road maintenance work in Cambodia was established with the introduction of the value-added tax (Road User Special Tax) in 2002. However, the operation is far from satisfactory : It has not been properly and efficiently managed, and funds necessary for road maintenance are either improperly disbursed, delayed or totally postponed to the next fiscal year due to shortage of funds caused by poor management. For the tax itself, there are many defaults in the operation, application and disbursement methods. The cash flow is problematic because of the disconcerted communication among Ministry of Economy and Finance (MEF), Ministry of Public Works and Transport, Ministry of Rural Development (MRD), and authorities in charge. The resource was inappropriately applied and used; either it was affected by the incapability of executing agencies for road maintenance in terms of road budgeting or the allocation was transferred to expenditure types deemed more urgent/important by the Royal Government.

4.3. Vehicles and transport means registration

According to various reports, there persists a percentage of nonregistered vehicles, including boats and trucks, particularly in the rural areas and areas near the border. It is assumed that most of the nonregistered cars come from smuggling. A survey shows that about 60 percent of motorcycles, 20 percent of light vehicles and 20 percent of heavy vehicles are not registered. This causes a loss in national revenue needed for constructing and rehabilitating infrastructure. Moreover, the situation proves unfair to citizens who actually pay registration charges and car holding taxes honestly. If the registration system is improved and correctly administered, the annual revenue of the country will increase considerably.

Finally, since proper registration comes with safety checks, the safety of passengers and road users will be managed.

4.4. Private sector participation in infrastructure development

There are many reasons private investment in infrastructure will not significantly increase. Infrastructure subjects private investors to major risks because the investments are often large and their costs can be recouped only over long periods of time. In addition, infrastructure projects often provide public services that are considered essential to the population, including the poor. As such, the pricing of infrastructure services becomes a sensitive issue: The rate of return that is deemed attractive to private investors is weighed against a rate that is affordable to the general population. The investments are also largely sunk; the assets cannot be used elsewhere. These factors

make the returns from infrastructure projects vulnerable and uncertain. Therefore, attracting private investment in infrastructure often requires guarantees against such risks.

Although the private sector is crucial for infrastructure development, the public sector should still play the lead role. In Cambodia, cases where private sector participation involved corruption abound. For instance, corruption comes in when the private sector participates in BOT projects in strategic national highways, licensing land and BOT concessions without bidding.

4.5. Dealing with socio-economic impacts of infrastructure development

Another major social issue related to road development in Cambodia is the resettlement and compensation to residents who are displaced or affected by development projects. There is an increasing number of cases where the affected property owners were badly treated. According to Cambodia's Constitution, the affected property owners should be compensated with an agreeable value. However, there is no written laws or subdecrees on resettlement as a national policy. Legal regulations should be established as soon as possible so that authorities can implement such rules consistently, even for a national budget project. Public consultation, and grievance and monitoring mechanisms are as necessary as the proper implementation itself. Monitoring mechanisms can ensure not only proper implementation but also the rehabilitation of Project-Affected Persons' (PAPs) lives after the implementation.

Right of Way (ROW) management is also an issue that should be tackled in the future.

The focal point of past disputes on this issue centered on who could be compensated as per the declaration (Prakas) in 1999, which identified measures of eliminating illegal land encroachment. The 2001 land law, meanwhile, prevents new squatters in the ROW. Therefore, the ROW management should implement measures that will effectively identify the legitimate people who will be affected by the project so as to segregate these from the new squatters in the area. Otherwise, PAPs will be increased and the compensation cost will bloat.

During infrastructure construction, other issues that ought to be taken into account are health and safety protection measures, and environmental impacts such as air pollution, water pollution, noise, and vibrations. Therefore, an Environmental Management Plan (EMP) on how to monitor impacts before, during and after the construction works should be set in place.

The results of more than three decades of conflicts within the country and outside its borders have made Cambodia one of the most heavily landmine/UXO-contaminated countries in the world. Landmine and UXO contamination covers about 3,075 areas or 4,466 square kilometers, which is equivalent to about 46.2 percent of all of Cambodia's villages. There is, therefore, a possibility that landmines and UXOs exist around construction areas. To avoid accidents from such, these mines should be cleared in cooperation with the Cambodian Mine Action Centre (CMAC).

5. CONCLUSION

Infrastructure in Cambodia is still in poor condition compared with that of other countries in the region due to its war, poor master planning, and lack of maintenance. Roads are critical because an overwhelming share of the transported volume of passengers and freight are via land; other means of transportation only play a complementary role to road transport.

The inadequate physical infrastructure---road networks, electricity, irrigation and water systems, and port facilities---is a major barrier to economic development and poverty reduction in Cambodia. Hence, infrastructure networks should continue to be recognized as a priority. To do so would involve considerable investment, capacity building, new policies and institutional reforms. It is a challenge that goes beyond the public sector and needs to involve the private sector. This, in turn, will require new approaches to the provision of infrastructure services and new financing mechanisms. It will also require the support of development partners. Moreover, considerable progress has been made over the last decade or so in moving toward increasing intercountry road networks in Asia, and the basic framework for such plan is being set in place. Examples of its programs include the financing and development of domestic road transport networks that have regional importance; the creation of intercountry road linkage plans and establishment of their design standards (i.e., the Asian Highway); and the construction of new intercountry roads in the GMS.

Cambodia is still in need of huge investments for its infrastructure. Therefore, the government shall have a long-term infrastructure plan that would require the

participation of the donor community and the private sector, at least for the next few decades.

As mentioned earlier, 23 percent of the total amount of aid Cambodia obtained from 1999 to 2003 was used for physical infrastructure development. This shows how important infrastructure is in Cambodia's development, particularly in terms of its sustainable economic growth and poverty reduction plans. Infrastructure is also a requisite for national (and regional) integration and in balanced development of the country's many provinces.

6. POLICY RECOMMENDATIONS

To address the issues on Cambodia's infrastructure development, some vital policy recommendations should be taken into account.

6.1. General Recommendations

The Royal Government and donor community should continue to invest in road infrastructure, especially in rural areas. Technical assistance to improve road management in rural areas will help sustain road rehabilitation efforts. Donors should also continue to support the government's Power Sector Strategy by helping the country to access low-cost sources of electricity, including imports from Thailand, Laos, and Vietnam, and develop renewable power sources such as hydropower and thermal energy. In addition, the government should support the participation of the private sector in electricity generation. At the same time, the EDC needs to improve its management

efficiency. Technical assistance for the EAC to strengthen its role as the independent power regulator is also required to assure that electricity is supplied at reasonable prices. Continued rehabilitation of irrigation systems is needed to promote agricultural sector development. The effectiveness of Water User Groups to manage irrigation systems is vital for assuring the sustainability of irrigation rehabilitation. Finally, port facility improvements are needed to reduce the costs and lead times of importing raw materials and exporting finished products. Infrastructure improvements will require a significant amount of investment from both the government and donors and will have to be carried out over the next decade or two.

Transport infrastructure development should continue to focus on the rehabilitation of high-priority trunk and feeder roads and bridges as this will help realize the potentials of agriculture, tourism and trade in the rural areas. There is also the need to develop a comprehensive transport policy framework, addressing issues such as development of a balanced construction and maintenance program, increased involvement of the private sector, and financing of road maintenance and cost recovery mechanisms. In the area of institutional strengthening, the MPWT will have to formulate strategies to improve its capacity to plan, manage, and implement road operations.

Major investments should be directed toward improving physical transport infrastructure that links Cambodia with countries in the region, especially Thailand, Lao and Vietnam, as well as toward enhancing sea and air access to international destinations, especially China. Energy, ports and airports should be efficient enough to handle forthcoming increase in production and trade. All these could greatly reduce

transport costs and increase the competitiveness of Cambodian products in the export markets. However, the full benefits of such developments will only be realized if both people and goods can move across borders at minimal cost.

6.2. Specific Recommendations

6.2.1. Dealing with infrastructure development projects

1) Public consultation and awareness survey. Public consultation with the people around project sites should be conducted so as to properly disclose information about the project and to get the residents to understand both the positive and negative impacts of such project. Here, the procedure of the project, the legal framework, and the grievance mechanisms would have to be properly explained as most of the people will not know all the issues on land acquisition and resettlement. Such consultation should be scheduled several times as necessary, such as before the conduct of a public awareness survey.

A public awareness survey, meanwhile, is necessary since this is a tool that can confirm the affected citizens' basic agreement to the project. If many people oppose the project, the project should be reconsidered. In addition to their basic agreement to the project, the people's needs and social situations can be clarified through the survey.

The survey should be conducted at the cut-off date that will be declared upon the project's "go" decision. This is so as to protect those legitimately affected by the ROW and prevent t illegal squatters from claiming for compensation.

2) **Resettlement action plan (RAP) and initial environmental impact assessment (IEIA).** Resettlement is one of the most critical issues on road development. The formulation of a resettlement action plan (RAP) is crucial after the project implementation date has been decided. The plan's purpose is to protect the livelihood of PAPs and to maintain the same standard of living as before the project. In this regard, the RAP should cover the necessary measures and formulate a monitoring plan after the resettlement takes place. It is recommended that the government entrusts the monitoring to NGOs if such NGOs have good communication with the people and well understand the road project itself as well as the governmental system. In this case, a good partnership between the government and such qualified NGOs should be established.

The MPWT, as the project owner, has to finalize and submit the Initial Environmental Impact Assessment to the Ministry of Environment (MOE) for project approval. The necessary additional surveys, such as the household survey (forming part of the public awareness survey), should be conducted in an effective and prompt manner.

3) Land issues and de-mining. Pertinent land issues include land administration and land use control. Strengthening land administration (such as land registration, land transaction control, squatter control) is necessary for the Ministry of Land Management, Urban Planning and Construction (MLMUPC).. Land use control pertains to, among others, the development permission and land use plan created by the MLMUPC and other relevant agencies such as the Ministry of Agriculture, Forestry, and Fisheries (MAFF) for agricultural development, and the MRD for rural development.

Landmine and UXO contamination is not only a security-related issue but has significant economic implications as well, particularly on land distribution, security of poor farming households in remote areas, and infrastructure development. The government should therefore guide the de-mining activities in Cambodia in accordance with international security standards and obligations. Again, such activities should be cleared and closely coordinated with the CMAC.

4) Controlling pollution. Areas mainly affected by air pollution, noise and vibration are the densely populated and large-traffic volume locations. One of the mitigation measures against these impacts during construction is to apply methods that minimize noise and vibration. Anti-noise measures include the use of noise barrier fences. Vehicle smoke emission should be inspected to avoid adding to air pollution. On the other hand, since there are no legal criteria on vibration, establishing a legal criteria on vibration is a necessary first step.

The EMP is required to include monitoring mechanism plans before, during and after the construction works. The items that must be included in the EMP, which the contractor will need to implement, should be reflected in the tender documents. A baseline survey will be necessary during the basic design stage to allow for comparisons against the situation before construction. Key items that need to be monitored include air pollution, water pollution, noise, vibrations, accidents and the settlement process, which includes the negotiation process and assessing livelihood recovery after the resettlement. In addition, to improve the EIA/IEIA, legal frameworks such as technical standards and guidelines should be established. Law enforcement, including the

monitoring system, along with capacity building of governmental agencies concerned, should be strengthened,.

Meanwhile, conventional EIA is not enough to reflect the long-term environmental impact of infrastructure development. Thus, Strategic Environmental Assessment (SEA), which takes into account the long-term ecological impact of infrastructure, can be an important policy tool in promoting sustainable infrastructure.

5) Improvement of traffic control and administration. In Cambodia, the traffic accident death rate stands out when compared to that of neighboring countries. Cambodia, after all, has a high rate of motorcycle accidents. An improvement of regulations and education of road users are necessary; so is the enhancement of infrastructure such as the provision of an exclusive traffic lane for motorcycles and traffic light facilities. Road safety and management should be enhanced by (1) the introduction of a driver's license system for motorcycles and of a car inspection system, reinforcement of the registration system, and expansion of the insurance regime and riding regulations for cow carriages within cities; (2) the provision of traffic lanes on suburban roads for exclusive use of motorcycles, reinforcement of the traffic signal system, implementation of full-size vehicle regulations within cities, and establishment of a sustainable public transport system, including bus and train operations; and (3) daily inspection and repair of roads; and (4) education of road users through the media and schools.

6) Human capacity building in infrastructure development. Infrastructure is more than hardware. It includes human capital and social infrastructure.[4] Human resource development is essential for infrastructure building and maintenance. Human capacity building as part of social infrastructure development in Cambodia is critical in enhancing economic performance and productivity.

A major constraint to attracting foreign direct investment (FDI) flows in Cambodia is the shortage of skilled labor. The private sector as well as FDI can generally help upgrade professional skills in host countries. It can provide efficient supply chain management, plus there is the ripple effect of technology diffusion. For the private sector to participate fully, a climate supportive of long-term commitment must be apparent in terms of policy framework, attitude and practice. To mobilize the private sector to contribute to human capacity building in Cambodia, there is a need to institutionalize the partnership between the public and private sectors. The government should facilitate the activities of private investors (domestic as well as foreign). In the area of management education and vocational training, the private sector should be involved in funding and supporting centers of excellence, which yield direct benefits to

[4] Infrastructure can be divided into economic infrastructure and social infrastructure. **Economic infrastructure** includes transport facility, villages electrified, irrigation, electricity, special economic zones, telephone, Internet, banks, and so on. They are certainly beneficial for "crowding in" of both domestic and foreign private investment in the concerned geographical region, contributing to economic growth. On the other hand, **social infrastructure** facilities through enrichment of human resources in terms of access to education, health, housing and drinking water improve the quality of life. These factors are primarily responsible for higher concentration of better human resources, which help improve productivity of labor in an essential way.

business. Involving the private sector in formulating training strategies and curriculum designs can ensure that human resources development meets the demand of companies and labor markets.

In addition, development partners should facilitate capacity building in Cambodia in the application of new technologies, support the development of micro, small- and medium-size enterprises, and encourage linkages between these and foreign enterprises. Foreign investors, to be socially conscious, should integrate with the local community, establish corporate citizenship, and engage in human resources development.

7) Improving an enabling environment for infrastructure development. Infrastructure improvements require the intervention of the government and donors, and private sector participation through various models such as the BOT has to be encouraged. Private sector involvement in infrastructure development does give rise to concerns: ensuring access to the poor, giving away national assets, bogus investors, and negative impact on market structure and competition are some of these. The private sector also has concerns of its own: Investment risks can be high and rates of return low. New approaches and innovative techniques can help overcome each other's concerns. To realize the potential of private sector involvement in infrastructure development in Cambodia, the government needs to put in place the appropriate enabling policy environment and make the necessary long-term commitment to infrastructure development.

A prerequisite for successfully attracting private investment in infrastructure projects is

a sound regulatory and institutional framework. Policies should facilitate free entry to infrastructure development to make the market competitive.

Competition in the market can discipline investors. The initiation of pro-competition policies or laws helps increase the level of rivalry among service suppliers in sectors such as electricity, telecommunications and the internet. Such increased competition would lead to lower prices and improved services. The existence of right laws would ensure that there is no collusion or cartel formation among service providers. In addition, a competition policy should be in place to avoid public monopoly from being replaced by private monopoly.

On the issue of investment risk, there are different ways to reduce it. They include improving the regulatory framework and business facilitation, and bringing in an investment consortium. If the enabling environment is inviting and the government commits innovative risk management, the potential for private investment in infrastructure will exist increasingly in Cambodia.

Regarding the return to investment, management contracts as an instrument can reduce costs, lessen leakage in production and distribution and lower charges to the end user. Cost recovery through the "consumer pays principle" can make economic sense. However, the consumer pricing of infrastructure services can be a challenge for the government because it can affect the poor and the poverty reduction strategy. The cost of infrastructure development is normally borne by the end user of the services. If the consumer cannot afford the service charges, the government and development partners

should allocate funds and development assistance to support service delivery systems targeted for the poor, as part of the government's commitment to poverty alleviation.

Foreign direct investment policies are attractive, but slow implementation of policy reforms is pervasive. The private sector and civil society can advocate policy reforms, but to be effective, they need to be empowered and placed on par with the state through certain mechanisms such as: (1) effective private sector representation and participation on infrastructure-specific regulatory boards and management institution; (2) public-private interagency committees within government line ministries, private sector associations, and government officials can review policy implementation over agreed time periods; and (3) joint government and private sector seminars focusing on information dissemination, brainstorming, and review of policy implementation. Therefore, policy improvements are needed on three broad fronts: Efficiency issues in the management and reform of the public sector; governance issues of institutional transparency, reliability and accountability; and private sector's willingness and unity of purpose in public-private partnerships. These will assure essential benefits: good and high-level policy formulation and implementation, institutional reliability, and effective private sector development and participation in infrastructure development.

6.2.2. Financing of infrastructure maintenance and development

In Cambodia, the maintenance of existing infrastructure assets should be the highest priority, as future rehabilitation or reconstruction costs will far exceed the cost of timely maintenance. However, both maintenance work and reconstruction are already the government's priorities

A strong political case needs to be made for increasing the funding for infrastructure maintenance (as deteriorating infrastructure still imposes large resource costs), and of infrastructure development. The pros and cons of taxation of road, rail, air and water transport users to cover the marginal cost users impose on society (e.g., road deterioration, traffic congestion, and environmental costs) should be explored on a sector-by-sector basis. As the Royal Government currently does not have enough financial, technical and human resources, private participation in infrastructure development is required and welcomed.

Generally, well-structured infrastructure projects grounded on an acceptable legal framework and based on documentation conforming to international standards can be financed in countries with low income or high risk, or both. Nevertheless, mobilizing foreign private finance will require innovative financing methods. It is therefore of equal importance to earn investors' confidence in the chances of success of projects and in the transparency and fairness of the procurement as well as implementation processes.

Meanwhile, private financing of infrastructure has a key role in public infrastructure. For example, an experimental project where partnership schemes between the public and private sectors is under way in Cambodia (i.e., Phnom Penh International Airport). One constraint to foreign investment in Least Developed Countries (LDCs), especially in Cambodia, is the size of the market. Regional and subregional economic cooperation and integration (e.g., ASEAN, GMS) can help overcome the problem of market size,

attracting private sector to invest in infrastructure. In the meantime, infrastructure building can facilitate regional and subregional economic integration, particularly if the parties involved are from the private sector. Therefore, infrastructure networks should take into account the regional context, where regional networking is feasible and beneficial to all participating countries. The international community should facilitate regional cooperation with the aim to link Cambodia's electricity, transport, and telecommunication networks with those of neighboring countries. It is particularly vital for Cambodia to engage effectively in regional and international trade, and tourism.

Therefore, institutional arrangements to promote private sector participation need to be promoted, including the setting up of public-private partnership (PPP) units and the regional institutional networks of such units. The PPP in infrastructure development in Cambodia is considered an important policy objective. Justifications for tapping private sector participation range from its potential as a source for financing, its efficient management capability, and new technologies it possesses.

However, because there are externalities associated with transport and communication services and Cambodia's private sector is relatively underdeveloped, the government is still required to play a major role in the provision of economic infrastructure. The government has to encourage private sector and community participation in infrastructure. Its policy framework should be conducive and should identify legal and regulatory rules for PPIs. To determine the role of the private sector in the provision of infrastructure, it is critical to ensure that the decision-making process is transparent and the public interest duly protected.

To improve the governance of PPI project transactions and to maximize the extent of PPI in Cambodia and the efficiency achieved by Cambodia, four guiding principles should be followed: (1) *Responsibility* means that the roles of each public entity have to be clearly defined so that there is no uncertainty about who is responsible for each step; (2) *Accountability* means that each responsible party must follow prescribed procedures with provision made for the rapid resolution of disputes; (3) *Predictability* means that the procedures have clear guidelines and criteria so that the outcome of each step is not subject to arbitrary or political decisions; and (4) *Transparency* means that the rules and procedures should be followed in an open and fair manner, and the necessary information should be made available to all.

In spite of best efforts, private sector participation in infrastructure development in Cambodia---especially in providing access to remote, sparsely populated and mountainous areas---would be difficult to obtain. Therefore, the international community should set up a special fund for infrastructure development to assist Cambodia. It should provide a higher level of financial resources to Cambodia to meet the latter's infrastructure needs. It could also encourage private sector participation in infrastructure through co-financing and play a catalytic role in attracting foreign direct investment (FDI). Furthermore, the international community and donor agencies should also provide technology and technical assistance for the development of human resources in Cambodia.

Another way by which the Cambodian government can attract financial resources is to

create a securities market. It has in fact planned to establish such at the end of 2009. In the securities market, not only the government, but also the private companies can issue bonds and stocks to the public to raise capital for infrastructure investments. Promoting the financial sector, including insurance sector, banking sector, and securities market significantly enhances Cambodia's infrastructure development.

To finance road construction and maintenance works, the government should secure necessary funds through improvement of defaults in terms of levying, operation and disbursement method by (1) allocating a small percentage of the tax revenue from import of gasoline and diesel to financing of road maintenance; and (2) allocating a part of the road user tax to road construction and maintenance works through the enforcement of a tax system on car registration.

6.2.3. Administration of agencies responsible for physical infrastructure

Many agencies in various ministries are involved in physical infrastructure development. The capabilities of many are limited, due to financial and human resources constraints and systemic issues. Some of the administrative systems in the region are of an extremely hierarchical nature. Much remains to be done to improve Cambodia's administrative, legal and regulatory institutions, before they could gain investors' confidence and elicit private sector participation in infrastructure investment. Therefore, addressing governance issues is a major priority of the government. Nevertheless, social networks can be utilized for awareness creation and better participation in infrastructure development, particularly on the local level.

Recently, many countries have increased local involvement, for example, in the construction and maintenance of rural roads. Also, there appears to be a general trend toward decentralization of infrastructure facilities. The creation of a new authority such as “Mass Transit Authority” or “Transport Authority” should be considered.

To eliminate problems caused by inefficient implementation relating to institutional, traditional and technical weaknesses in road administration, some measures should be taken: (1) prepare guideline for road maintenance management; (2) implement by project cycles, which consists of maintenance preparation, implementation, operation, and evaluation, all identified by the National Road Maintenance Committee (NRMC); (3) develop capacity of local contractors and road authorities; (4) achieve provincial capacity development and decentralizing; (5) be transparent in prioritizing the project planning; (6) foster collaboration between the MRD and MPWT in the technical and physical aspects of road maintenance so as to assure that all authorities responsible for managing the road network in Cambodia do work together; (7) improve the project’s cash flow despite weak communication and coordination among related ministries; (8) strengthen financial auditing to guarantee a sound budget/expenditure management; and (9) strengthen technical auditing to assure the quality of output. It is worth noting that the NRMC was established to maintain and identify all standards, design methods, and quality control of projects.

Encouraging small-scale private providers. Small-scale providers of infrastructure services should be encouraged, or at the very least, not be constrained or regulated out of business. Unregulated small-scale providers commonly emerge in conflict-affected

countries to meet the pent-up demand of poor, rural, and peri-urban communities, especially in electricity and water supply. The small-scale providers can play a key role in the absence of established public utilities or major private operators. Their role can be especially important in post-conflict countries, where large-scale electricity projects, for example, typically take six or seven years to materialize. The government's success in handling such providers can prove crucial to poor and isolated communities.

6.2.4. Improving regional cooperation and integration

Cambodia shares borders with three countries: Thailand, Vietnam, and Laos. Its current trade in goods with its neighboring countries, especially with Vietnam and Thailand, is substantial. Furthermore, some of Cambodia's exports are transited through Vietnam. Roads connecting the neighboring countries are economically vital. Thus, in addition to domestic road networks, priority should also be given to building roads between the three countries through various border-crossing points (See the table below). Transporting goods and person through those crossing points is not only beneficial to Cambodia's trade, but would also speed up the integration of the region because all four countries are already members of the ASEAN and GMS.

6.2.5. Long-term transport infrastructure development plan

Transport infrastructure development requires long-term policy measures. Cambodia's needs to set priorities for policy measures with the following perspectives: Policy measures should promote the ongoing restoration work as these are essential for both mid- to long-term initiatives.

Cambodia is now moving from the stage of rehabilitation and reconstruction to the next stage: full-fledged development. In this transitional period, the country needs to both formulate a comprehensive transportation scheme consistent with the five-year Socioeconomic Development Plan and other plans, and to carry out programs based on this transportation plan. This is necessary if Cambodia wants to develop its transport infrastructure both efficiently and effectively. At the same time, it needs to improve coordination among different modes of transportation.

It is essential to set out the framework of a comprehensive transportation plan before drafting a mode-specific scheme. It is also necessary for the Cambodian government to authorize the implementation of such a comprehensive plan. In addition, such a plan needs to consider key international as well as domestic transport systems, as Cambodia is in the center of Indochina.

The government needs to secure equipment and materials, develop human resources and improve technical capacity for the transport facilities that it maintains, manages, and operates. Currently, inadequate communications systems hamper the government's activities for maintenance, management and operation of transportation infrastructure. However, as restoration and construction work for telecommunications facilities progresses, Cambodia has to take advantage of this progress and improve such communications systems by, for example, creating the necessary telecommunications networks for transportation infrastructure. This action may be part of the Cambodian government's initiative in developing its information infrastructure.

6.2.6. Telecommunications infrastructure

Telecommunications infrastructure development requires similar policy measures as those for transport infrastructure development. In addition, the MPTC has converted state-owned enterprises under its management into public corporations in 2000. With this new form of organization and a new management method, the MPTC should promote operational efficiency in such corporations. This is a tall order for such public corporations, as this requires them to achieve the seemingly incompatible objectives of keeping user charges low and offering services in less profitable rural areas, while rapidly modernizing and expanding services. The expansion of services to rural areas is crucial for rural development.

6.2.7. Power Infrastructure

The price of electricity in Cambodia is very expensive compared to those in the region. Cambodia now needs to formulate a long-term plan for the energy sector, especially on how to secure stable power resources and electrify rural areas.

The role of the private sector in developing electric power resources should not be overemphasized, as the World Bank suggests. The World Bank's suggestion may be appropriate for Bangkok and some other key cities in Southeast Asia where the electric power market is well developed, but not so for Cambodia. In fact, the high cost of purchasing electric power from Cambodia's IPPs is hampering demand in Phnom Penh and other major urban cities. Cambodia thus needs to dip into its public funds for the

development of power resources across the country, with special consideration to hydroelectric plants. The national grid network should be built across the country to improve power distribution. At the same time, Cambodia has to study how to use its public funds appropriately.

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Chapter 3: Infrastructure Development in China

Liang Chuan

Abstract

This report summarizes the current status of infrastructure development in China and the infrastructure construction demand for infrastructure development. The optional investments on infrastructure are described based on the poverty alleviation goal and economic trade goals. The finance investment mechanism for infrastructure in China is also depicted. The key issues in relate with infrastructure construction and infrastructure investments, infrastructure technology and management, policy issues, and institutional reform issues are discussed. Policy recommendations are made based on the discussion on key issues.

1. INTRODUCTION

Infrastructure development in China has rapidly upgraded within the last five years (the Tenth Five-Year Plan). Infrastructure investment has been the engine driving the economic growth of China. The gross domestic production of China reached 22 trillion yuan, increasing at an annual rate of 10.8 percent in 2006. Infrastructure development and economic growth are mutually pursued.

The economic structure has transformed into a socialist market-orientated economy since 1986, which has been consolidated in the early 1990s. Export-orientated economy supported by infrastructure development contributes largely to the economic growth.

2. CURRENT STATUES OF INFRASTRUCTURE DEVELOPMENT IN CHINA

2.1. Roads

Road length has increased 250,700 km in China from 2000 to 2005, reaching 1,930,5 00km in 2005. The layout of road network has further improved. The technical grades and road surface grades have been both upgraded. Highway construction has broken through the historical records. Road length in the counties and towns have continuously and rapidly increased. The road density has also increased, and the accessibility by roads has been improved. Passenger transport and freights through roads are up 26 percent and 29.2 percent, respectively, of the number of passengers transported by all the transport tools.

2.2 Railways

By the end of 2005, the length of running railways was 75,000 km, 9.9 percent up from 2000. It included double tracked rail of 25,000 km and electrified rail of 20,000km, 19.4 percent and 35.6 percent up, respectively, from 2000. Passengers by rail in 2005 reached 1.156 billion, which grew 1.92 percent from the previous year. The turnover of passengers was 606.2 billion in 2005. Freight and turnover both grew 10 percent.

2.3. Airline

The civil airline of China became the second large air transportation system in the world, next to the United States, in 2005, based on data on the total turnover of regular airlines by the International Civil Airline Organization of the Member States.

2.4. Waterway

The transportation capacity of the internal waterway increased from 20.37 million tons in 2000 to 30.35 million tons in 2004, 50 percent up. The average transportation capacity per ship rose from 104 tons to 216 tons. The fright capacity by sea rose to the fourth place globally, while finished freight by sea accounted for 7 percent of the

world's total.

2.5. Electricity

The electricity power industry has developed at a rapid speed with the increase in the electricity generation capacity from 1368.5 billion kilowatts in 2000 to 2497.5 billion kilowatts in 2005, growing at an annual rate of 12.8 percent. China has established six large-scale stable regional electricity networks, and formed a preliminary national connected networks except for Sinkiang, Tibet, Hainan, and Taiwan. The three corridors for electricity transmission from the west to the east have also been formed in northern China, in central China, and in southern China respectively.

2.6. Oil and Gas Pipes

The lengths of oil and gas pipes increased from 24,700 kilometer in 2000 to 44,000 kilometer in 2005. The piping capacity of oil and gas was estimated at 616.351 million tons in 2005, 68.4 percent more than the 2000 level. The flagship project to pipe gas from Xinjiang to Shanghai became operational in December 2004, which opened the main energy artery from the western China to the eastern China. It is also the symbol of the technological improvement in the field of natural gas pipe construction in China.

2.7. Infrastructures connecting with other countries

The Chinese government has exerted efforts toward regional integration in the field of infrastructure development. It has opened international road transports at more than 60 border gates, and 140 routes for passengers and freights with the neighboring countries. China has signed 10 bilateral transportation agreements with Russia, Mongolia, and other countries, and three multilateral agreements on transportation with the concerned countries. In addition, China has participated in facilitating efforts to reach an agreement among governments on the Asian road network, the transportation cooperation within the Great Mekong Sub-regional Economic Cooperation of (GMS) framework, as one of the member states of Shanghai Cooperation Organization. China has established a primary network of transportation corridors, made up of the following:

Guangxi International Corridor. Guangxi Province is becoming an international corridor connecting Southwestern China with ASEAN countries. Guangxi is neighbored with Vietnam, and has roads linking the Youyiguan border gate with Hanoi via Liangshan city of Vietnam, with total length of 180 km. Guangxi connects Central China with Hanoi by Xiang-Gui Rail with rail of Vietnam. There are 12 border gates including five first–grade national border gates and 25 border trade sites with roads leading to Vietnam. The five sea ports (Fangcheng Port, Qingzhou, Beihai, Zhengzhu, and Tieshan) with designed throughput more than 200 million tons have sea navigation through Hong Kong, Macao, and Southeast Asia, which are also connected to the southwest China provinces via rails and roads.

Asia-Europe Continental Bridge. China has strengthened the construction of highway and local main road networks as well as the improvement of roads at the border area to Russia. The main waterway has also been reinforced alongside the ports and berths.

Yunnan International Corridors. Yunnan province is located in the southwest of China, and neighbored with Vietnam, Laos and Myanmar. There are nine national-level border gates and eight provincial-level border gates opened to the three countries. Yunnan Province is the first province of China to have involved in GMS Cooperation mechanism. Kunming, the capital of Yunnan province is the hub of the North-South Economic Corridor of GMS. Yunnan international corridors consist in highways and railways depicted in the following tables.

a. Roads to neighboring countries

Table 1: Roads Connecting with Neighboring Countries

Name of the road	Length	Within China	The other country	The other country
Kunming-Hanoi	756 km	400 km of highway	296 km planned for four driveways in Vietnam	
Kunming-Lao-Bangkok	1818km	688km high standard way	240 km under improvement in Laos	890km of in Thailand
Kunming-Rangoon	1899 km	732 km	Mujie-Mandele –Rangoon 460+707 km	
Kunming-Myanmar-India (Reduo)	1220km	698km	477 km in Myanmar	45km in India

Source: "The Statistic Year Book on Tertiary Sector of China—2006", P154.

b. Rails to neighboring countries

Table 2: Rails Connecting Neighboring Countries

	Linking with
Kunming-Hekou-Hanoi	Eastern line of Pan- Asian Railway
Kunming-Mohan-Meding	Middle line of Pan- Asian Railway
Kunming-Ruili-Lashu of Myanmar	Western line of Pan-Asian railway
Baoshan-Tengchong-Myanmar –India	

Source: "The Eleventh Five-Year Plan on Railways" at http://www.china-mor.gov.cn/zizhan/guihuasi/

2.8. Infrastructure construction demand

Road construction demand. A total of 179 national road centers need to be constructed. The total roads length of China will be extended to 23 million km, including 70,000 km highway, which is the basis for forming the main road structure. The main road layouts consist of five longitudinal and seven altitudinal highways. These 12 national highways have a total length of 35,000 km, connecting Beijing to the provincial capitals and municipalities that are directly under the central government. More than 200 cities accounting for 93 percent of the large and medium-sized cities with above half a million

population are linked to form a road network.

An estimated 600 million people are covered by this road network. This number accounts for 44 percent of the total population in 2000. The average traffic speed of the national highways is expected to increase. The link between the national highway with the provincial backbone highways for priority economic development must be strengthened. China will also construct a highway that will be connected to the national high way network. The high way network of the eastern coastal region shall be improved to meet the demand for social economic development, and the highway network of the western non-developed region shall be expanded.

Rail construction demand. The goals of rail construction are to construct a new railway measuring 17,000 km (7000 km for passenger transportation) in length, to convert an 8000-km rail into double-tracked rail, and to electrify a 15,000 km route). The 90,000 km national rail, targeted as a multimodal transportation system, and double-tracked and electrified rail, shall comprise comprise the railway under construction.

The 90,000 km of national rail is targeted for MT (multi-modal management), and double-tracked and electrified rail shall amount up to 45 percent respectively.

The total length of the national railway will be increased to more than 20,000 km. The capacity of the rail corridor is to reach 1.8billion tons. The total length of the western railway network shall stretch to 35,000 km[1]. A rail container transportation system is to be formed around the country; the rail technology and equipment shall be modernized. The rail transportation system is targeted to facilitate safe, stable, sustainable, economic, efficient development. The rail assembling sets of 200 km /hour speed shall be produced domestically while the speed will be increased seven times. The annual passenger transportation is predicted to increase to 1.5 billion, with freight capacity of 3.5 billion

[1]Ou Yangjie: 2007. "Railways in the Western Region Scale up One Third" on *People's Daily.* 8 March.

tons, growing 30 percent than 2005[2].

Aviation infrastructure construction demand. Efforts are underway to strengthen the airport infrastructure over a period of five to ten years. More airports are to be built, bringing the number to 191 from the existing 50 airports as of 2005, including central airports, eight large-scale airports, 40 medium-sized ones, and 140 small-scale airports[3].

Waterways construction plan. Priority for waterway construction is on the construction of a ports system with a throughput of 5 billion tons. A 10,000 km river waterway is planned to be constructed by 2010. Rail and road transportation shall be constructed in tandem with ports. An integrated waterway management information platform and integrated ports logistic information service platform is also in the pipeline[4].

Electricity infrastructure construction plan. Power generation capacity including thermal power, micro-hydropower and nuclear power is targeted to upgrade to a new level. The technological improvement and equipments for desulphuration of thermal power generation and re-utilization of hydropower is targeted to improve. Electricity transmission network is planned to be expanded[5].

Energy infrastructure construction demand. In five to 10 years, the government plans to further develop the coal industry by building modern large-scale coal production bases. It will also work toward an effective and clean utilization of coal resource. It aims to upgrade coal production technology and equipment-making techniques. Coal mining construction is targeted to be high-capacity and high-efficiency. The government

[2] Lange Steel:2006, 'The Outline of Railway Eleventh Five-Year Plan of China" [online] http://info.steel.hc360.com/2006/10/27083630688.shtml

[3] State Bureau of Civil Airline : 2007, "The Eleventh Five –Year Civil Aviation Development Plan of China(2006-2010)", http://www.bbs.feeyo.com/posts/219/topic-0014-2197599.html

[4] State Bureau of Civil Airline:2007 "The Eleventh Five-Year Civil Aviation Development Plan of China (2006-2010)" [Online] http://www.bbs.feeyo.com/posts/219/topic-0014-2197599.html

[5] Ma Kai**:** 2006. " The Current Situation and Future Trend in Energy Development During the Eleventh Five-Year Plan In China", in " The People 's Daily." P.6 , 15 July, 2006.

will also develop liquid coal and coal gas, and extraction of coal gas.

It is targeted to further develop petrol oil and natural oil gas by increasing the production of petroleum and gas. The government also wants to improve the pipe network that will transmit petrol and gas, to construct petrol and gas reserve bases, to actively participate in international cooperation in petrol exploration.

Then, too, the government also wants to develop new alternatives and regenerative energies such as wind energy and biology energy, solar energy, underground thermal energy, and sea energy. Regenerative energies are targeted to grow 16 percent by 2020, from 7 percent in 2005 and 2006. In addition, it wants to strengthen the construction of joined infrastructure for supply and demand from the different kinds of energies such as coal, electricity, and petrol.

3. INFRASTRUCTURE DEVELOPMENT DEMANDS AND PLANS

3.1. Infrastructure development demand

Economic development goal. The Eleventh Five-year Plan of the government is targeted to raise the GDP of China from 18,200 billion yuan in 2005 to 26,100 billion yuan in 2010 an annual growth rate of 7.5 percent. The GDP per capita is projected to grow from 13,985 yuan in 2005 to 19,270 yuan in 2010.

Poverty alleviation goal. By 2010 the national rural poverty alleviation plan is targeted to assist 10 million poor rural folk to make sure their basic needs are met, and improve the living conditions of 250,000 rural poor households living with persons with disability. Under the Socialist New Rural Construction Plan, some 148,000 poverty stricken rural villages will benefit from skills training for farmers and improved village roads, electricity and water supply, provision of health services and broadcasting networks. A nine-year compulsory education is planned for enforcement in rural areas.
Foreign trade goals. Service trade is targeted to realize service import and export value of 400 billion US dollars by 2010, based on an annual growth rate of 20 percent. The

merchandise trade is projected to significantly improve its competitiveness, resulting in enormous social and economic benefits for all. These are intended to be achieved through better-quality goods and the pursuit of trade balance.

For processing trade, the enterprises chain is expected to extend to research and design, intensive development, and marketing and services. Technical innovation and technical transfer will be strongly encouraged to replace the simple processing trade agents. Efforts will also be made to adapt to the evolving trends and patterns in foreign trade.

3.2. Infrastructure investment demand

Evaluation on infrastructure investment demands. Investment in traffic infrastructure shall put in place safe, convenient, and efficient traffic and transportation system by upgrading the road layout, rails, airlines and shipping, and by improving the multi-modal transport. The investment priority is in development a railway, urban rail traffic, road network, airlines, waterways and piping.

The investment priorities of energy infrastructure are put on building large-scale coal production bases, improving middle and small-scale coal mining, making use of coal gas, and encouraging joint adventure of coal and electricity. It is also prioritized to optimize the investment on coal electricity with focus on large-scale high-efficiency assembling set. In addition, the investment on electricity network construction, utilizing hydrological power in ordered manner, encouraging nuclear power, and upgrading the scale to transmit electricity from the west to the east on the basis to protecting ecosystem.

The investment also shall strengthen the treatment of rivers and waterway, water resource distribution and water resource management .

Current investment plan and investment mechanism. The investment mechanism will integrate the improved investment adjustment and control mechanism, as well as the financial budget performance assessment system to facilitate the efficient use of public

funds. The transfer payment between central government and provincial governments shall be improved, and financial management system below provincial governments shall be defined. The reformed system for investment planning and budgeting is targeted to improve transparency and the regulations, together with the improvement on the budget performance auditing. The autonomous investment right of private sectors shall be implemented with a clear definition of the investment range of the governments. The system to investigate the responsibilities of the decisionmakers on the public investment shall be established.

The middle and long-term financial investment plan of China revolves around five objectives:

a. To support optimizing the economic structure of national importance and upgrading industries as well as key programs
b. To support the investment on social and public infrastructure construction
c. To support the investment on strengthening agricultural fundamental position such as large-scale ecological agriculture conservation programs, critical agriculture science and technology development, and large-scale grain and cotton production bases
d. To support the investment on industries underpinning the national economy such as mechanical industry, electronic industry, car industry, and petrol chemical industry.
e. To support the investment on the development of high-tech industries

4. ISSUES FACED BY INFRASTRUCTURE DEVELOPMENT IN CHINA

4.1 Infrastructure development

Infrastructure insufficiency persists. The general level of infrastructure development in China is still low. The infrastructure insufficiency has not been averted, impeding efforts toward national economic and social development. Average per capita infrastructure is comparatively low due to massive population and the widespread underdevelopment of

the infrastructure.

Regional infrastructure development is imbalanced. The infrastructure in the eastern region of China is more developed compared with the western and the central regions (for detail see table 2). Such imbalance in the level of infrastructure across the regions is barrier to the socioeconomic development of some regions. In particular, the remote mountainous frontiers and poverty-stricken areas are still suffering from poor transportation infrastructures and other facilities like telecommunication, water supply, drainage, electricity supply and etc.

Table 3: Imbalances in infrastructure development across the different regions of China

Index	The Northeast	West Reg.	Central China	The East
Working rail mileage	17.4 percent	37.7 percent	22.6 percent	22.3 percent
Road mileage	9.3 percent	36.55 percent	28.3 percent	25.9 percent
Highway mileage	7.4 percent	25.8 percent	26.1 percent	40.7 percent
Passenger turnover	8.3 percent	23.5 percent	27.8 percent	40.5 percent
Cargo turnover	7.5 percent	12.2 percent	12.8	67.8 percent
Post and telecommunication service	8.5 percent	19.6 percent	17.5 percent	54.4 percent

Source: "China Statistic Year Book –2007" published by China Statistic Press, in September 2007

National infrastructure development programs are piecemeal. Many national infrastructure programs, such as "transmitting western region's electricity to the east of China" and "Qinghai-Tibet Railway Construction Program," to name a few, are poorly linked with other infrastructure. As a result, the "flagship" infrastructure programs could not be effectively and efficiently utilized.

Extensive development pattern has resulted in a poor-quality, low-technology service and management. The infrastructure has been expanded rapidly within a short term in China. The road length in 1978 was 890,020 km, which was eventually extended to 3,457,000 km in 2006. The level of road technologies, however, remains low, and the

quality of infrastructure, service, and management is in a poor state.

Table 4: Comparison between Standard Roads and Non-standard road

Unit: 10,000 kilometer

Total road length in 2006	Standard roads					Non-standard roads length
	Highway length	Other Road Length	Grade-I road length	Grade-II road length	Subtotal length	
345.70	4.53	-	4.53	26.27	228.29	117.41
100 percent	1.31 percent	-	1.31 percent	7.60 percent	66.04 percent	33.96 percent

Source: "China Statistic Year Book –2007" published by China Statistic Press, in September 2007

4.2. Issues with the investment in infrastructure development

Public finance is grossly insufficient. The reform of tax system in the 1980s decentralized the power to manage public finance. Thus the central government is unable to afford all construction costs. The "finance-sharing system" for infrastructure development investment has been set up, and the central and the local governments at the different levels share the costs. In general, the central government assumes the cost of most investments in the national roads, while the provincial government does the same for provincial roads, the governments at the county and township levels for their own, and so on and so forth. Consequently, the poor areas couldn't afford the investment and thus give up construction, while the rich areas have rapidly improved the infrastructure.

The financial expenditure of the central government has increased more than the revenues recently. The demand for investments has created great pressure on the central government's revenues.

Table 5: Financial Deficit in 2006

Unit: billion yuan

National Revenuers in 2006	Expenditures	Financial deficit
3876.02	4042.273	216.253

Source: "China Statistic Year Book –2007" published by China Statistic Press, in September 2007

Table 6: Investment in fixed assets in 2006

Unit: billion yuan

Total investment in fixed assets	Investment in transportation, postal service, and logistics	Investment in electricity, gas and water supply	Water conservancy, environment protection, public facility management	Sub total of the three items
10999.82	1213.81	858.57	815.27	2887.65

Source: "China Statistic Year Book –2007" published by China Statistic Press, in September 2007

Increasing pressure and risk of repayment of commercial bank loans. Much of foreign investments and commercial loans are used for infrastructure construction in order to deal with the problem of insufficient public finance. The managers of infrastructure construction are under pressure and in increasing risk of running out of funs, particularly the provinces in the western region of China, which have weak self-investment capacity and limited capitals. They are dependent on commercial bank loans for infrastructure investment. For some regions, commercial bank loans account for 80 percent of the total investment in transportation. In addition, the repayment terms for infrastructure loan are relatively long, and the banks face the risk of incurring bad debts.

Investment structure is not rational and the investment efficiency is low. Investments in fixed assets of the urban regions account for the majority of the total while investments

in rural area account for 4 or 11 percent. Most investments are for new construction, and a small portion for maintenance and improvement. In 2006, 60 percent of the investments in fixed assets of urban region were used for new construction. The input in infrastructure construction is massive and the waste is serious due to an irrational investment structure.

4.3. Issues on technology and management

Management of infrastructure is ignored. Poor management of infrastructure has resulted in low transportation capacity of roads and railways, crowded cities**,** and overloaded traffic routes. Secondly, the construction, operation and management of infrastructure are mainly dependent on bureaucratic systems, where the role of the market is weak. In addition, a lot of enterprises steeped in outdated management systems have not adapted to the times. Thirdly, market protectionism and sector-orientated management systems have affected otherwise smooth delivery of freights and passengers. Fourthly, blind competition in transportation market has resulted in chaos.

Technological level is low. In the rail transportation system, double-track rail and electrified rail length accounts for a small portion of the total railway length. In regard to rail transportation(39.8 percent and 37 percent, respectively, as of 2006), while the level of centralized train-dispatching is low (6.6 percent). There are few computerized chain stations (23.3 percent). Well-equipped passenger trains account only for a small proportion of the total ; those with soft beds make up 7.84 percent; trains with hard beds, 32.52 percent; and hard seat-trains, 41.50 percent. The train speed for cargo is only 32.1 km per hour; and the speed for passengers is 65.4 km per hour (as of in 2006). Freight transfer takes 4.4 hours**,** and takes 15.2 hours to operate.

For road transportation, the total number of civilian vehicles (still as of 2006) is 36,973,500, including 26195,700 units for delivery, which are mostly small or mini-buses. There are 9,863,000 vehicles for freights, which are mostly light and small trucks.

Comprising the shipping system in 2006 were 157,805 powerboats in China . These had a net carrying capacity load of 98.2115 million tons and an average net carrying capacity load of 6.2255 million tons. The number of barges was 36,555; they had a net carrying capacity load of 12.0156 million tons and an average net carrying capacity load of 3.287 million tons. Berths at ports in the coastal areas of China numbered 3804, of which only 883 are 10,000 ton-grade or above berths accounting for 23.12 percent. The rivers have 7044 berths in 2006, of which only 225 were 10,000-ton or above-grade berths, which accounted for 3.19 percent.

Postal and telecommunication services have improved rapidly recently. However, many people still have no access to postal and telecommunication services. The number of towns with post offices in China accounts for 76.2 percent; the number of telephones and mobile phones per 100 persons is 63.40, and the number of mobile phone per 100 persons is 35.30. Around the whole country, 137 million people have access to the Internet while the majority do not.

Multimodal transport is still undeveloped. The combination of modes of transport is poor due to poor coordination among the different sectors of the governments administrating roads, railways, ships, and airlines separately, as well as lack of joint planning. In addition, communication between the administrative departments and the private sector is poor. The resulting poor combination of all transport infrastructure cannot ensure safety and quality service, because the operational efficiency of infrastructure is low. The rate of carry cargo by road is less than 50 percent, and carry cargo by rail, 54 percent.

Construction of software infrastructure lag behind the hardware. The low operational efficiency of infrastructure is mostly due to lagging behind software construction. The vehicles for cargo and containers are not standardized; the equipment for freight loading, package, storage, and transit are inadequate. Consequently, freight transit is time-consuming, and freights are easily damaged during transit. In addition, the management is poorly equipped with few computers, and the information flow is slow,

which affects the quality of customer service. There are two factors for this problem. One is that the governments have not built an efficient public information service platform, and that the logistic firms lack sufficient funds to promote the management software.

4.4. Issues on policies and regulations

Construction of infrastructure is monopolized by the government. The roles of foreign investors, private sector, and the society in general in infrastructure development in China is limited to certain fields, geographical region, and investment scales unlike in other sectors that have been the target of economic reforms. As a result, capital can't be mobilized through various channels, and resources can't be optimized. Governmental monopoly in infrastructure development calls for a reassessment at the very least.

The legal system is weak. The legal system for infrastructure development is still weak, and some vital laws are lacking. Where infrastructure construction is concerned, there are still no regulations for defining and identifying the investors and the basis for their entry into the market. There are also no regulations that help ensure fair trade and competition. The lack the regulation for market supervision, price system and service standards also get in the way of effective infrastructure management.

Policy system is incomprehensive. The national strategic planning is not supported by sectoral and the regional plans, so the layout of the infrastructure is not rational. An open orderly competitive market system has not been established, making it difficult to have joint ventures across regions and ownership systems. The macro-level regulation of the government is not effective. The mechanism for price forming system is not well established. Governmental monopolization and disorderly market exist side by side. Local governments raises construction funds by overcharging (for certain services) . The investment policy is skewed toward urban areas, and the infrastructure of the rural area lags behind urban areas. The massive infrastructure projects are concentrated in major areas (i.e., centers of political power, business districts, and adjacent sites), while remote parts are being neglected.

4.5. Issues on institutional reforms

Communication network is lacking. The absence of a communication network that will connect regions, sectors, and industries and ensure that resources can be optimized has not been set in place. An existing international information sharing mechanism needs to be improved, or inaccessible in some areas. Most infrastructure facilities were not built as joint undertakings with foreign counterparts. Communication and coordination with neighboring countries is inadequate, so many roads in border area are not connected with those other countries. China just has recently signed an agreement on transportation, investment and trade facility with ASEAN. The implementation of the agreement must be sustained on both sides.

Risk prevention mechanism is lacking. Infrastructure construction faces economic, social, political, ecological as well as security risks. The government seems to be concerned only with economic issues, which prevents it from addressing these other risks. Reliance, for instance, on huge borrowings to fund the construction or expansion of certain infrastructure projects entails risks. From a macroeconomic perspective, such an investment is going to pull up consumption or consumer prices. Then, too, once a foreign partner pulls out its investment in such an undertaking midway through the project, government will be left with a problem that could be too difficult to solve. In addition, destruction on the environment and the ecosystem, cultural relics, and the farmers' grieving for their lost lands caused by land acquisition for infrastructure construction are core social, political and ecological issues that need to be addressed as well. Illegal cross-border activities such as smuggling and human trafficking are other issues that pose grave threats to society and which require prompt attention from the government and which will help resolve the risks earlier identified.

Regional integration of infrastructure development is sluggish. The infrastructure development is imbalanced among the different regions of China, and the pace for regional integration of infrastructure development is sluggish. Little effort is put in coordination among different sectors and private sector, and the same to the combination

of the infrastructure for high efficiency. Pursuing for sectoral interests by setting tollgates to collect money has prevented the flows of freight, capitals, populations, and information.

5. POLICY RECOMMENDATIONS

Based on the foregoing discussion, the following are proposed actions for stakeholders, notably government, to consider:

Pursue infrastructure development as an investment priority for economic development. The long-term infrastructure deficit has not totally translated into rapid infrastructure development. Resources must be mobilized to cater to huge infrastructure demands.

Promote infrastructure integration and equitable development to narrow the regional disparities in China. Infrastructure disparities have driven a wedge between the western and eastern regions and resulted in unequal opportunities for the people. The development of infrastructure for the rural communities and the western and central regions should be given priority to resolve the disparities created by the lack of infrastructure integration.

Promote the viability of financing sources. Limited public finance cannot possibly meet the huge infrastructure demands. Infrastructure investments in 2006 reached 3 trillion yuan. These covered transportation, logistics, power supply, gas, and water, hydrology, environment and public infrastructure maintenance, and facilities for sports, education and recreation. The scale and viability of investments from the private sector should be mobilized, and policies for foreign investments in infrastructure should be further explored, among others to make to simplify otherwise complex procedures.

Institutionalize the financing mechanism. Financing for infrastructure construction in China is complex. It also suffers from poor coordination and lack of transparency among the different sectors involved. It is therefore not surprising if investment efficiency is low. Micro-level adjustment and control, planning of infrastructure development should be strengthened. The financing mechanism should be

institutionalized and regulated to promote resource integration. Innovative financing mechanism should also be pursued.

Strengthen the cooperation between governments and the private sector in infrastructure development. The increasing capacities of the private sector for investment in China has great potential for infrastructure development. The government should define clearly its roles and responsibilities of both alongside those of the private sector. The government should be service-oriented and seek to improve management efficiency in the bureaucracy. At the same time, efforts at supervision and evaluation of infrastructure development should be strengthened to correct the disparities between theory and practice.

Establish a regional cooperation mechanism for infrastructure development. The ongoing globalization and economic integration require cooperation and integration in infrastructure development to ensure coordinated action. In particular, coordination with Yunnan province must be pursued since it serves as a link between China and Eastern Asia, Southeastern Asia, Southern Asian with the other regions of China.

Promote logistic development. Improvement of infrastructures is the premise of logistics industry. To accelerate the growth of the logistics industry, government must give priority to improving the infrastructure for storage transit, refrigeration, transportation, and information sharing. Similar efforts must be extended to accommodation and restaurants facilities. Logistical hubs and multimodal transportation should be improved to facilitate trade development. Human resource development for the logistics industry should also be the target of appropriate measures.

Promote trade facilitation. The agreements between China and ASEAN on free trade economic zone, freight trade, and service trade have been the framework to promote trade development and investment. Trade between China and ASEAN reached US$160.8 billion 2006. The implementation of bilateral agreements should be consistently pursued by, among others, enforcing tariff reduction, zero tariff, facilitation of immigration procedures, freight transit, and custom and visa services.

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Chapter 4: Infrastructure Development in India

Prabir De

1. INTRODUCTION

India's rise in recent years is a most prominent development in the world economy. India has re-emerged as one of the fastest growing economies in the world. India's growth, particularly in manufacturing and services, has boosted the sentiments, both within country and abroad. With an upsurge in investment and robust macroeconomic fundamentals, the future outlook for India is distinctly upbeat. According to many commentators, India could unleash its full potentials, provided it improves the infrastructure facilities, which are at present not sufficient to meet the growing demand of the economy. Failing to improve the country's infrastructure will slow down India's growth process. Therefore, Indian government's first priority is rising to the challenge of maintaining and managing high growth through investment in infrastructure sector, among others.[1]

The provision of quality and efficient infrastructure services is essential to realize the full potential of the growth impulses surging through the economy. India, while stepping up public investment in infrastructure, has been actively engaged in involving private sector to meet the growing demand. The demand for infrastructure investment during

[1] See, Government of India (2007, p. 16)

the 11th Five Year Plan (2007-2011) has been estimated to be US$ 492.5 billion (Planning Commission, 2007). To meet this growing demand, Government of India has planned to raise the investment in infrastructure from the present 4.7 percent of GDP to around 7.5 to 8 percent of GDP in the 11th Five Year Plan. In general, efforts towards infrastructure development is continued to focus on the key areas of physical and social infrastructure.

The present paper is a shorter version of the India country report carried out by the author on-behalf of RIS for ERIA. This version presents a quick profile and prospects of India's physical infrastructure sector.

2. PROFILE OF INDIA'S PHYSICAL INFRASTRUCTURE

Performance of physical infrastructure in Indian economy in last one and half decades has been mixed and uneven. Table 1 provides the latest achievement of India's physical infrastructure sector. Over years, India's soft infrastructure grew much faster than the hard infrastructure. For example, India's rising trade has been reflected in growing container port traffic, which increased from less than a million in 1991 to about 5 million in 2005 with an annual growth rate of about 266 percent since 1991. In contrast, hardware components, like railways, roadways and airways, witnessed little expansion in last one and half decades. In general, performances of these sectors (hardware) are nevertheless poor, when counted their densities in terms of country's surface area or population. Densities in terms of access or spread of rail and road length clearly indicate that road sector has been successful, compared to railways, in spreading the network as

well as providing an access in the economy.

Table 1: Overview of Physical Infrastructure

Particulars	1991	2000	2005	AAGR (%) (1991-2005)
Railways length (1000 km)	62.46	62.76	63.47	0.13
Road length (million km)	2.35	3.32	3.85	5.32
Fixed line and mobile phone subscribers (per 1,000 people)	7	36	128	150.35
Air freight (million tons per km)	493.10	547.65	773.22	4.73
Air passengers carried (million)	10.72	17.30	27.53	13.07
Air transport, registered carrier departures worldwide (million)	0.12	0.20	0.33	14.89
Container port traffic (million TEUs)	0.15	2.45	4.94	266.01
Electric power consumption (kWh per capita)	295.02	402.02	457.32	4.58
Electric power consumption (kWh)	255.65	408.42	493.78	7.76

Note: AAGR – Annual Average Growth Rate (%) for the period 1991 to 2005.

Source: *World Development Indicators CD ROM 2007*, World Bank

Table 2: Trends in Rail and Road Density in India

		1991	2000	2005
Rail	Spread*	19.00	19.09	19.31
	Access**	0.07	0.06	0.06
Road	Spread*	714.99	1008.76	1171.60
	Access**	2.71	3.26	3.52

Notes: *Route (length) density per 1000 sq. km of surface area.

** Route (length) density per 1000 population.

Source: Calculated based on *World Development Indicators CD ROM 2007*, World Bank

What follows is that software part of India's physical infrastructure (like telecom, air and port services) performed well, thus not only helped the country to maintain a faster growth but also integrated the economy with the world market at a faster pace. At the same time, the hardware component of the country's physical infrastructure (e.g. road, rail, power) comparatively grew slowly, thus negated the country's development process.

Therefore, in order to unleash India's full potentials, development of hardware component of India's physical infrastructure perhaps deserves utmost attention. This also indirectly indicates high investment potentials in roadways, railways, power and the associated components in India.

2.1. Roads

The most distinct part of India's physical infrastructure development in recent years is the development of road network across the country; per sq. km. of surface area in India is now endowed with one km of roadways. India has one of the largest road networks in the world, aggregating to 3.34 million km. The country's road network consists of Expressways, National Highways, State Highways, Major District Roads, Other District Roads and Village Roads. The road network, as on December 2007, comprises 66,590 km of National Highways, 128,000 km of State Highways, 470,000 km of Major District Roads and about 2.65 million km of other District and Rural Roads. National Highways comprise only about 2 percent of the total length of roads and carry about 40 percent of the total traffic across the length and breadth of the country. Out of the total length of National Highways, 32 percent is single lane/intermediate lane, 56 percent is 2-lane standard and the balance of 12 percent is 4-lane standard or more.

The National Highways Development Project (NHDP), the largest highway project ever undertaken by the country, is being implemented by the National Highway Authority of India (NHAI). NHDP Phase I & II envisage 4/6 laning of about 14,279 km of National Highways, at a total estimated cost of Rs.650 million (at 2004 prices). These two phases

comprise of Golden Quadrilateral (GQ), North-South and East-West Corridors, Port Connectivity and other projects. The Golden Quadrilateral (GQ-5,846 km) connects the four major cities of Delhi, Mumbai, Chennai and Kolkata. The North-South and East-West Corridors (NS-EW-7,300 km) connect Srinagar in the North to Kanyakumari in the South, including spur from Salem to Kochi and Silchar in the East to Porbandar in the West. By November 30, 2006, 6,776 km of national highways pertaining to NHDP had been completed, the bulk of which (5,475 km) lie on the GQ. Constraints faced in the timely completion of NHDP include delays in land acquisition, removal of structures and shifting of utilities, law and order problem in some States, and poor performance of some contractors. Nearly 93 percent works on GQ have been completed by November 2006, and the NS and EW corridors are expected to be completed by December 2009. With the completion of about 93 percent of the GQ, a substantial impact upon the economy is already visible. At this stage there is a need to focus attention on corridor management and road safety, and NHAI has already put in place a corridor management policy.

Financing of NHDP

For implementation of NHDP Phases I and II, the main source of finance of NHAI is the fuel cess. The present rate of cess is Rs. 2 per litre on both petrol and diesel. A part of this cess is allocated to NHAI to fund the NHDP. This cess is leveraged to borrow additional funds from the domestic market.

Besides, the Government of India has also negotiated various loans from World Bank (US$ 1,965 million), Asian Development Bank (US$ 1,605 million) and Japan Bank for

International Cooperation (Jap. Yen 32,060 million) for financing various projects under NHDP. These loans from the multilateral institutions are passed on to NHAI by the Government partly in the form of grant and partly as loan. NHAI also negotiated a direct loan of US$ 165 million from ADB for one of its projects. The funds provided to NHAI, including its borrowings from the market, are utilized for meeting project expenditure as well as debt servicing.

Future plans

Government has set ambitious plans for upgradation of National Highways in a phased manner in the years to come. A presentation was made before the Committee on Infrastructure proposing the following projects in addition to the completion of the ongoing works included under NHDP Phase-I and Phase-II:

・4-laning of 11,113 km (NHDP Phase- III) including 4,035 km already approved.
・Accelerated road development programme for the North Eastern region.
・2-laning with paved shoulders of 20,000 km of national highways (NHDP Phase-IV).
・6-laning of GQ and some other selected stretches covering 6,500 km (NHDP Phase-V).
・Development of 1,000 km of expressways (NHDP Phase-VI).
・Development of ring roads, bypasses, grade separators, service roads etc. (NHDP Phase-VII).

As a policy, Government has decided to take up future phases of NHDP proposals

mainly on a PPP basis. Implementation of projects through construction contracts will be only in exceptional cases where private sector participation is not possible at all.

2.2. Ports

Ports have been playing a crucial role in facilitating India's international trade and also in generating economic activity in their surroundings and hinterland. India's coastline of 7,517 km. is added with 12 major ports and 187 non-major ports. Of the non-major ports, around 60 are handling traffic. The total traffic carried by both the major and minor ports during 2005-06 was estimated at around 570 million tonnes. The 12 major ports carry about 3/4th of the total traffic, whereas Vishakhapatnam (on the eastern coast) is the largest port in India. Despite having adequate capacity and modern handling facilities, average turnaround time is 3.5 days as compared with 10 hours in Hong Kong, which undermines the competitiveness of Indian ports. Congestion is due primarily to the slow evacuation of cargo rather than a lack of handling capacity, since ports are not adequately linked to the hinterland. To this end, all port trusts have set up groups with representatives from NHAI, the Railways, and State governments to prepare comprehensive plans aimed at improving road-rail connectivity of ports. An efficient multimodal system, which uses the most efficient mode of transport from origin to destination, is a prerequisite for the smooth functioning of any port. It involves coordinating rail and road networks to ensure good connectivity between port and hinterland.

In 2006-07, up to October 2006, cargo handled by major ports registered growth of 6.6

per cent, down from 10.4 per cent observed in the corresponding seven months of 2005-06. About 80 per cent of total volume of ports' traffic handled was in the form of dry and liquid bulk, with the residual consisting of general cargo, including containerised cargo.

There was an impressive growth of 13.6 per cent per annum in container traffic during the five years ending in 2005-06. Half of the world's traded goods are containerzied, and this proportion is expected to increase further. The largest container port in the world in 2005, Singapore, processed 23.19 million TEUs (twenty foot equivalent units). The 10th largest port, Los Angeles in the USA processed 7.49 million TEUs. In contrast, Jawaharlal Nehru Port (JNP), India's largest container port, handled roughly 2.67 million TEUs in 2005-06.

The annual aggregate cargo handling capacity of major ports increased from 397.5 million tonnes per annum (MTPA) in 2004-05 to 456.20 MTPA in 2005-06, with the average turnaround time increasing marginally from 3.4 days to 3.5 days in 2005-06. The average output per ship berth-day improved from 9,240 in 2004- 05 to 9,267 tonnes in 2005-06. The pre-berthing waiting time at major ports on port account, however, increased from 6.03 hours in 2004-05 to 8.77 hours in 2005-06. Significant inter-port variations in pre-berthing waiting time is continued to persist.

National Maritime Development Programme (NMDP)

Following the success of NHDP that is expected to vastly improve connectivity in India,

the Government of India has undertaken the NMDP with an investment of Rs. 610 billion to boost infrastructure at major ports in the next ten years. Under the NMDP, 228 projects have been identified for implementation in two phases through public-private partnership. By identifying specific projects and other measures, the NMDP will over the next 10 years give a concrete shape to the vision and strategy of the National Maritime Policy. The envisaged investment for these projects is estimated at Rs 610 billion. Of this, Rs 392.38 billion will be coming from the private sector, Rs 114.45 billion through budgetary support and Rs 50.78 billion from port trusts' internal resources.

2.3. Civil Aviation

2.3.1. Airports

The operations, management and development of the airports at Delhi and Mumbai were handed over to the joint venture companies namely Delhi International Airport (P) Ltd. (DIAL) and Mumbai International Airport (P) Ltd. (MIAL). The strategic joint venture partners in DIAL are a consortium led by GMR Group along with Fraport as the Airport Operator, and Malaysian Airports and India Development Fund as the other members. The joint venture partners together hold 74 per cent equity with the balance 26 per cent being held by Airports Authority of India (AAI). Similarly, in case of MIAL, the strategic joint venture partners are a consortium comprising of GVK Group along with Airport Company South Africa as the Airport Operator, and Bidest, South Africa as the other member.

Various agreements/contracts for handing over the control of the two airports to DIAL and MIAL were executed in April 2006; and with effect from May 3, 2006, the transactions have become effective. The companies have since finalized their master plans for a 20 year period.

Construction work at greenfield airports of international standards at Hyderabad and Bangalore is in progress.[2] The two airports are likely to be fully operational by the middle of 2008. Proposals to set up greenfield airports in Navi Mumbai, Kannur in Kerala, Goa and Pakyong near Gangtok in Sikkim are in the pipeline. A Greenfield international airport is already operational in Kochi, Kerala.

Airports Authority of India (AAI) has decided to develop and modernize 35 non-metro airports in the country, namely, Agati, Agartala, Agra, Ahmedabad, Amritsar, Aurangabad, Bhopal, Bhubaneshwar, Chandigarh, Coimbatore, Dehradun, Dimapur, Goa, Guwahati, Imphal, Indore, Jaipur, Jammu Khajurao, Lucknow, Madurai, Mangalore, Nagpur, Patna, Port Blair, Pune, Raipur, Rajkot, Ranchi, Trichy, Thiruvananthapuram, Udaipur, Vadodara, Varanasi, and Vishakapatnam. The Committee on Infrastructure has approved the report of the task force for the development of 35 non-metro airports. Development of airports in India's North Eastern Region (NER) will be taken up by AAI on a priority basis.

2.3.2. Airport Economic Regulatory Authority (AERA)

[2] The first phase of international airport at Hyderabad was completed and opened to public in the 2nd week of February 2008.

Through an Act of Parliament, Airport Economic Regulatory Authority (AERA) is proposed to be set up to fix, review and approve tariff structure for the aeronautical services and monitor pre-set performance standards at Indian airports. The Authority will ensure a level playing field for all categories of airport operators and also oversee and deal with natural monopoly and common user/ carrier segments of airports. Government has adopted an overall liberal approach in the matter of grant of traffic rights under bilateral agreements with various foreign countries. A revised air services agreement was signed with USA that led to increased co-operation in the aviation sector. Under this agreement, both sides can designate any number of services to any point in the territory of the other country with full intermediate and beyond traffic rights. Similarly, traffic rights were enhanced with 19 other countries — Australia, Belgium, Canada, China, Egypt, France, Germany, Italy, Japan, Kuwait, Mauritius, the Netherlands, New Zealand, Oman, Scandinavian countries, Singapore, Spain, UAE (Sharjah), UK — to provide for more flights and better connectivity with these countries and also more commercial opportunity to all operating carriers.

The signing of a new Air Services Agreement is the first milestone for the purpose of establishing air connectivity with new destinations. During the recent past, a number of new Air Services Agreements were initialled (signed) based on modern practices in the civil aviation sector. Air Services Agreement with some countries were signed a long time ago and needed updating in view of the changed circumstances and developments in the international civil aviation scenario, and with respect to newer standards and recommended practices. Some of these countries are Australia, Brazil, Finland, Iceland,

New Zealand, Qatar, Tunisia, UK and USA. The tourist charter guidelines were significantly liberalized in 2004. All airports in the country were opened for international tourist charters flights and Indian passport holders were also allowed to travel on the tourist charter flights. Recently, Government has decided to liberalise the tourist charter guidelines further.

2.3.3. Airlines

A major fleet acquisition is underway by the national carriers, namely Indian Airlines, Air India and Air India Charters' Limited. The project of Indian Airlines for acquisition of 43 Airbus aircraft has been approved by the Government. The first A-319 from this batch of new aircraft joined the fleet of Indian Airlines Limited in October, 2006 and the remaining 42 aircraft will arrive in batches by March, 2010. After receiving Government approval, Air India signed an agreement with Boeing Company on December 30, 2005 for the acquisition of 8 B777-200 LR, 15 B777-300 ER, 27 B787 Dreamliner aircraft for itself, and 18 B737-800 aircraft for its subsidiary company Air India Charters Limited, which operates a low cost airline under the brand name Air India Express. These aircraft would be delivered to Air India between end of November, 2006 and December, 2011. Up to December, 2006, Ministry of Civil Aviation has issued no objection certificate for import/acquisition of 42 aircraft for scheduled operators, 62 aircraft for non-scheduled operators and 31 aircraft for private operators. Besides this, in principle approval for 135 aircraft was also granted to scheduled operators.

2.3.4. Air traffic

Policy initiatives have had a marked impact upon airline traffic. Air traffic has grown up substantially since 2004-05. During the period April-September, 2006, international and domestic passengers recorded growth of 15.8 percent and 44.6 percent, respectively, leading to an overall growth of 35.5 percent. During the same period, international and domestic cargo recorded growth of 13.8 percent and 8.7 percent, respectively, resulting in an overall growth of 12.0 percent.

2.4. Railways

Indian Railways, world's second largest rail network under a single management, has been contributing to the development of the country's industrial and economic landscape for over 150 years. Of the two main segments of the Indian Railways, freight and passenger, the freight segment accounts for roughly two-thirds of revenues. Within the freight segment, bulk traffic accounts for nearly 95 percent, of which more than 44 percent is coal. Improved resource management, *inter alia*, through increased wagon load, faster turnaround time and a more rational pricing policy has led to an improvement in the performance of the railways during the last two years.

Rationalization of classification is aimed at securing eventual elimination of cross-subsidies in fares and freight, and evolving a more transparent and cost-based tariff regime. This process necessarily requires increase in freight rates for commodities being transported below cost and lowering the freight charges for commodities being

moved at abnormally high rates. In the freight segment, the number of commodities in goods tariff has been reduced from 4,000 commodities to 80 main commodity groups in 2005-06, and further to 27 groups in 2006-07. The total number of classes for charging freight has been reduced from 59 to 17.

The high-density network connecting the four metropolitan cities of Chennai, Delhi, Kolkata and Mumbai, including its diagonals, popularly called the Golden Quadrilateral has got saturated at most of the locations. Given the present growth scenario, the Railways expect to carry 95 million tonnes incremental traffic per year and about 1,100 million tonnes revenue earning freight traffic by the end of the Eleventh Five Year Plan. This entails large investment for capacity augmentation.

Dedicated Freight Corridors (DFCs)

Development of dedicated freight corridors (DFCs) for carrying additional traffic is essential in view of the high growth in demand. Therefore, the Railways have proposed a 2700-kilometer long railway line project (Eastern Corridor from Ludhiana to Sonnagar as Phase-I – 1,279 Km. and Western Corridor from Jawaharlal Nehru Port near Mumbai to Dadri / Tughlakabad – 1,483 Kms). Both the Eastern and Western Corridors will be made suitable for running of longer and heavier trains of 25 tonne axle load. While the Eastern Corridor will be electrified, the Western Corridor will operate on diesel traction in order to permit Double Stack Container operation. Logistics parks are proposed to be developed on DFC. An SPV called Dedicated Freight Corridor Corporation of India Limited (DFC-CIL) has been formed to implement the project.

2.5. Urban Infrastructure

Urban infrastructure consists of drinking water, sanitation, sewage systems, electricity and gas distribution, urban transport, primary health services and environmental regulation. The process of urbanization has gathered considerable momentum in recent years and this has put urban infrastructure and services under severe strain.

Urban transport

Urban transport is one of the key elements of urban infrastructure. The major objective of urban transport initiative is to provide efficient and affordable public transport. A National Urban Transport Policy (NUTP) has been formulated with the objective of ensuring easily accessible, safe, affordable, quick, comfortable, reliable and sustainable mobility for all.

Revised guidelines for preparation of comprehensive city transport plans and DPRs have been prepared and circulated to all State Governments/UTs for availing of financial assistance to the extent of 40 per cent of cost as Central assistance under the present scheme of Urban Transport Planning. Detailed guidelines have also been formulated for the guidance of the States and cities and preparation of DPRs for both rail-based and road-based public transport.

Delhi and Kolkata have introduced Metro Rail system in their cities. Delhi Mass Rapid Transit System (MRTS), a joint venture between the Government of India and the Govt.

of National Capital Territory of Delhi, is being implemented by the Delhi Metro Rail Corporation (DMRC).

The Bangalore Mass Rapid Transit System (MRTS) contemplates construction of metro corridors along East-West (18.1 km.) and North-South (14.9 km.) in Bangalore. The Government of Karnataka has got financial appraisal of the project conducted recently. The estimated completion cost of the project is Rs.56.05 billion. Bangalore Metro Rail Corporation (BMRC), a joint venture company, is executing the project, which is scheduled to be completed by 2011. The first section of 7 km. will be completed in 2009.

The Government of Maharashtra has proposed a MRTS for Versova-Andheri-Ghatkopar on the basis of Mumbai Metro Master Plan. The project — Mumabi Metro Rail Project — consists of two corridors. First corridor is of a total length of 11.07 kms. –Versova-Andheri-Ghatkopar. Completion cost is estimated at Rs. 23.56 billion and it is proposed to be funded through Viability Gap Funding (VGF). The second corridor is Colaba-Bandra-Charkop line of 38.23 km. length. Estimated cost is Rs. 88.25 billion (at June 2005 prices). While giving in-principle approval for the project, the Government of Maharashtra has been asked to exhaust the VGF route first.

2.6. Special Economic Zones (SEZ)

SEZs are designated duty-free enclaves with developed industrial infrastructure. These zones are regarded as foreign territory for the purpose of duties and taxes, and are

excluded from the domain of the custom authorities to enjoy full freedom for the in and outflow of goods. SEZ units enjoy a tax exemption for seven years: 100 percent exemption in first 5 years, and 50 percent in the remaining 2 years. They have the facility to retain 100 percent foreign exchange earnings in Export Earners Foreign Currency Exchange accounts. All SEZ units are free to sell goods in the domestic tariff area (DTA) on payment of applicable duties.

During 2005-06, exports from functioning SEZs, which are mainly the former EPZs were around US$ 5 billion. At present 1,016 units are in operation in these SEZs providing direct employment to over 179,000 persons (about 40 per cent of whom are women). Private investment by entrepreneurs for establishing units in these SEZs is of the order of about Rs. 31.63 billion. After the SEZ Act and SEZ Rules came into effect on February 10, 2006, formal approval has so far been granted to 237 SEZ proposals and in-principle approval has been granted to 164 SEZ proposals. Out of the 237 formal approvals, notifications have already been issued in respect of 63 SEZs. In these 63 new generation SEZs which have come up after February 10, 2006, investment of the order of Rs.111. 94 million has already been made in less than one year. These SEZs have so far provided direct employment to 15,097 persons. It is expected that total investment in these SEZs would be around Rs. 584.59 million and 890,700 additional jobs will be created by December 2009. It is also expected that if all the 237 SEZs become operational, investment of the order of Rs. 3000 billion may take place and 4 million additional jobs may be created.

3. INFRASTRUCTURE INVESTMENTS REQUIREMENT IN INDIA

India is expected to grow at an average 9 percent per annum in next few years.[3] Accompanying this growth will be an increase in demand for infrastructure services. Economic and population growth prospects are expected to place additional pressure on existing infrastructure facilities. Therefore, addressing these challenges will be essential is the infrastructure sector is to continue fostering economic growth rather than becoming a constraint. In other words, a failure to respond to this demand will cause bottlenecks to growth and hamper poverty alleviation efforts.

Table 3: Requirement of Infrastructure Investments in India during 2007-2011

Sectors	**Anticipated Investment in 10th FYP (2002-2007)**	**Projected Investment in 11th FYP (2007-2011)**	**Percentage Change**
	US$ billion		**%**
Electricity	70.5	150.4	111.3
Roads and bridges	31.7	76.1	140.1
Telecom	22.5	65.1	189.3
Railways	20.3	62.2	206.4
Irrigation	32.1	53.1	65.4
Water and sanitation	15.6	48.6	211.5
Ports	1.3	18.0	1284.6
Airports	2.1	8.5	304.8
Storage	2.3	5.5	139.1
Gas	2.1	5.0	138.1
Total	200.5	492.5	145.6

Source: Government of India (2007)

To sustain 9 percent growth, the Government of India has estimated that an investment

[3] See, Planning Commission (2007)

of over US$ 492.5 billion during the 11th Five Year Plan (2007-2012). The infrastructure investment has increased in the past few years, driven by government initiatives and private participation, but that need to be escalated in coming years. Some of the important infrastructure investments are given in Table 3. The Government of India expects that 22-25 percent of the investment (of US$ 384 billion) required is to come from private sector (Government of India, 2007). According to the Committee on Infrastructure, headed by the Indian Prime Minister, these investments are to be achieved through a combination of public investment, public-private-partnerships (PPPs) and exclusive private investments, wherever feasible. To sum up, the Indian infrastructure space has gained much importance in the past few years, and provides immense opportunities for growth and development.

Therefore, it is clear that there is substantial infrastructure needs in infrastructure sector in India, which, in other words, also offers large investment opportunities. Many of the new investments (such as gas pipelines) seem to be viable on commercial terms and should be suitable for partnership with private investors. For many other infrastructure investments also Public-Private–Partnership (PPP) is emerging as the preferred instrument, where the private sector gets its normal financial rates of return while the public sector partner provides concessional funding based on the long-term direct and indirect benefits to the economy. New instruments such as Viability Gap Funding (VGF) through a special purpose vehicle (SPV) set up recently by the Government of India to fund mega infrastructure projects may be relevant for other Asian countries as well.

4. GOVERNMENT POLICY ON INFRASTRUCTURE DEVELOPMENT: PUBLIC – PRIVATE PARTNERSHIP

India has created specialized institutions for long-term infrastructure financing and there are certainly many arguments for establishing a regional investment bank, similar to the line of India's IIFC. Viability Gap Financing (VGF) is likely to be successful instrument in managing much needed gaps in road development in developing Asia and LDCs where domestic resources are limited and suffer from capacity constraints. While this institution could certainly play an important role by tapping into global financial markets and channelling funds to infrastructure projects, their mere existence will not increase investment if the underlying obstacles precluding investor confidence are not addressed—as the shortage of viable projects for funding by the IDFC or IIFC illustrates.

4.1.Public Private Partnership (PPPs) in Infrastructure

Government is actively pursuing PPPs to bridge the infrastructure deficit in the country. Several initiatives have been taken during the last three years to promote PPPs in sectors like power, ports, highways, airports, tourism and urban infrastructure. Under the overall guidance of the Committee of Infrastructure headed by the Prime Minister, the PPP programme has been finalized and the implementation of the various schemes is being closely monitored by the constituent Ministries/Departments under this programme.

Indian experience shows that competition and PPPs can help in improving infrastructure.

The opening of the telecoms sector is a case in point. Opening up the sector has led to massive investments and expansion in supply coupled with improvement in quality. The target of 15 percent tele-density set for the year 2010 was realized in 2007. Further, the cost of service today is lower than that in any other country in the world. Similarly, competition in the aviation sector has resulted in the creation of new capacities and much greater choice for travelers. The annual growth in air traffic has been in excess of 20 percent and fares have dropped significantly. Even in the road sector, PPPs have demonstrated their efficacy wherever they have been used such as on the Jaipur-Kishengarh highway.

4.2.Viability Gap Funding in Infrastructure Projects in India

An investment of about US$ 493 billion would be required in the infrastructure sector during the Eleventh Five Year Plan (2007-2011). These investments are to be achieved through a combination of public investment, PPPs and exclusive private investments, wherever feasible. According to the Government of India (2005), the Viability Gap Funding (VGF) or Grant means a grant one-time or deferred, provided under this Scheme with the objective of making a project commercially viable. The total VGF under the PPP scheme of the Government of India shall not exceed 20 percent of the total project cost; provided that the Government or statutory entity that owns the project may, if it so decides, provide additional grants out of its budget, but not exceeding a further 20 percent of the total project cost. The VGF is normally in the form of a capital grant at the stage of project construction. Proposals for any other form of assistance may be considered by the Empowered Committee and sanctioned with the approval of

Finance Minister on a case-by-case basis. The VGF up to Rs. 1 billion (about US$ 25 million) for each project is sanctioned by the Empowered Institution (here through IIFC), subject to the budgetary ceilings indicated by the Finance Ministry. The Empowered Committee is also entitled to sanction VGF up to Rs. 2 billion, depending upon the project feasibility, and amounts exceeding Rs. 2 billion may be sanctioned by the Empowered Committee with the approval of Finance Minister.

5. INDIA'S OVERLAND CONNECTIVITY WITH EAST ASIA: SOME CROSS-BORDER INFRASTRUCTURE INITIATIVES

India attaches utmost importance towards development of connectivity with Southeast and East Asian countries. The importance of overland connectivity through cross-border transport corridors is not only for the trade, but it would also facilitate investments in infrastructure sector. It will also bring many rich rewards for bordering areas. Some of the recent initiatives linking India with ASEAN are as follows.

5.1.India – Myanmar-Thailand Trilateral Highway

India – Myanmar – Thailand Trilateral Highway (IMTTH) from Moreh (in India) to Mae Sot (in Thailand) through Bagan (in Myanmar) links India with Southeast Asia. The IMTTH is divided into three phases; the first phase includes 78 km of new roads, upgradation of about 400 km of roads, construction of all-weather approach lanes, rehabilitation/reconstruction of weak or distressed bridges and a detailed examination of a project on the Ayeyarwaddy river as well as a causeway. The entire project is being funded through government resources. Phase-I of the IMTTA has already taken up in

early 2005. India assumes responsibility of 78 km of missing links and 58 Km of upgradation as part of Phase-I. India may also take up additional 132 Km of upgradation. Thailand would take up upgradation of 136 km and 62 km sectors of Phase-I and another 100 km as part of Phase-II. Myanmar indicated willingness to take up intermediary approach roads, reconstruction/ rehabilitation of weak bridges. India has agreed to offer credit at concessional terms to Myanmar for financing new constructions from Chaungma-Yinmabin (30 km.) and Lingadaw-Letsegan-Pakokku (48 km.). India has also agreed to consider similar financing of the upgradation to two-lane standard of the Yinmabin-Pale-Lingadaw (50 km.) inside Myanmar. Further, India has agreed to consider, subject to internal approvals, financing of the upgradation of the Bagan-Meiktila (132 km.) segment in Myanmar. Indian has also agreed to undertake the preparation of a Detailed Project Report (DPR) for construction of a bridge on the Ayeyarwaddy river and for the causeways near Kyadet. Thailand has also agreed to extend concessional loans for financing the upgradation to two-lane standard of the Thaton-Hpa-an-Kawkareik section (136 km.) and Kawkareik-Myawaddy section (62 km.). The Thailand side also agreed to assist Myanmar in financing of the route Thaton-Mawlamyine-Mudon-Kawkareik as a second phase of the project. Myanmar has agreed to finance construction of all weather intermediate lane approach roads at both ends from Pakokku to Bagan up to the existing ferry crossing and the rehabilitation/reconstruction of only distressed and weak bridges. Myanmar has decided to explore the possibility of important commercial segments of the highway being constructed, operated and maintained by operators on a commercial basis.[4]

[4] Sources: Ministry of External Affairs, Government of India, and De (2005)

5.2.India – Myanmar – Thailand – Vietnam Railway Cooperation: Delhi – Hanoi Railway Link

Railways can play a very positive role in integrating India with her eastern neighbours. Needs are two folds – (a) to link India's Manipur with India's main railway corridor, and (b) to re-establish and renovate railway networks in Myanmar. Harmonisation of railway track in the region is very much essential.[5] Without having a compatible and strong railway system inside Myanmar and Bangladesh, closer communication between NER and its immediate neighbours will be unfulfilled. Indian government has come forward and extended US$ 56 million credit line to the Myanmar government for upgradation of 640 km railway system between Mandalay and Yangon section.[6] Similar initiative should be taken up for up-gradation of railway network system in southern (Yangon to Dawei) and northern (Mandalay to Kalay) Myanmar. A possible connection between Myanmar and Thailand could be via Thanbyuzayat and Three Pagoda Pass, and between India and Myanmar could be by constructing new railway line between Tamu and Kalay. On completion of these projects there could be possibilities for India – Myanmar – Thailand – Malaysia - Singapore rail link. On completion of these projects, there could be possibilities for India – Myanmar – Thailand – Malaysia - Singapore rail link, and finally a railway system that will connect Delhi with Hanoi.

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[5] Indian Railways is actively engaged in harmonization and construction of railway tracks in NER. Considering the projects already sanctioned and under construction, Diphu – Karong – Imphal - Moreh rail link (in Indian side) is identified for development which will link India with ASEAN. Although at present construction work is being carried out in Diphu – Karong section, linking Karong with Morea via Imphal would link India with Thailand provided railway system in other side (Myanmar) is also developed simultaneously.

[6] Source: Ministry of External Affairs, Govt. of India

6. CONCLUDING REMARKS

Provision of quality and efficient infrastructure services is essential to realize the full potential of the emerging Indian economy. Indian government's first priority is therefore rising to the challenge of maintaining and managing high growth through investment in infrastructure sector, among others. To sustain 9 percent growth, the Government of India has estimated that an investment of over US$ 492.5 billion during the 11th Five Year Plan (2007-2012) is required. Therefore, there is substantial infrastructure needs in infrastructure sector in India, which, in other words, also offers large investment opportunities. Public-Private–Partnership (PPP) is emerging as the preferred instrument, where the private sector gets its normal financial rates of return while the public sector partner provides concessional funding based on the long-term direct and indirect benefits to the economy. New instruments such as Viability Gap Funding (VGF) through a special purpose vehicle (SPV) set up recently by the Government of India to fund mega infrastructure projects may be relevant for other Asian countries as well.

The cross-border infrastructure component is an important determinant of regional integration. If countries are not inter-linked each other through improved transportation network, regional integration process will not move ahead at a desired pace. In India, development of cross-border infrastructure, especially transportation linkages and energy pipelines with neighbouring countries is underway and expected to contribute to the regional integration in Asia by reducing transportation costs and facilitating intra-regional trade and services. Nevertheless, there are many challenges. It is

important for India to enhance its overland connectivity with East Asia in order to effectively facilitate the Asian regional integration.

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Chapter 5: Infrastructure Development in Indonesia

Haryo Aswicahyono and Deni friawan

1. INTRODUCTION

Indonesia is the largest archipelagic country in the world and the world's fourth most populous country. The area, which covers around 1,919,440 square kilometers, consists of five main islands and about 30 small archipelagoes, totaling about 17,508 islands, with a population of over 234 million people. Java Island, which is home to about 70 percent of Indonesia, is the most densely populated area in Indonesia, with about 945 people per square kilometer. In contrast, the most densely populated Outer Islands have only 90 people or fewer per square kilometer.

After experiencing a severe economic crisis in 1997, the Indonesian economy has, in many ways, relatively recovered from the East Asia financial crisis. By 2006, the economy has grown at 6-6.5 percent per year while inflation has been kept at single digit. Indonesia's estimated Gross Domestic Product (GDP) for 2006 was around US$ 364.5 billion, with a per capita GDP, PPP (constant international price US$) of about US$ 3,900 (World Development Indicator, 2007).

Low investment in the past several years after the economic crisis have been one of the important factors in explaining such low economic growth. Several studies have revealed that the inadequate infrastructure was a major obstacle to recovering the

investment climate, lowered business confidence and eventually limited growth.

In fact, the infrastructure condition in Indonesia has been in crisis in the last ten years. The road conditions are either severely congested or poorly maintained. Indonesia's teledensity still lags behind that of its neighbors. Electricity load shedding is also occurring in Java and Bali while severe power shortages are experienced in other main islands. The percentage of the population with access to piped water has actually fallen while water quality and regularity of service delivery are also declining.

This study attempts to: provide an assessment of the state of infrastructure development in Indonesia, outline some important issues and challenges in infrastructure development in Indonesia, and offer policy recommendations to address those issues and challenges.

The rest of this paper is organized as follows. Section 2 reveals the current status of infrastructure development in Indonesia. In this section, several major infrastructure indicators are shown to reveal the infrastructure's sectoral conditions and challenges. Moreover, this section also discusses the current policy status in infrastructure development in Indonesia. In Section 3, the infrastructure development plans in Indonesia are reviewed while Section 4 reveals several existing issues in infrastructure sector in Indonesia. Lastly, in Section 5, some potential policy recommendations are offered.

2. THE CURRENT STATUS OF INFRASTRUCTURE DEVELOPMENT IN INDONESIA: SECTORAL CONDITION AND CHALLANGES

2.1. Roads and railways

The access to road transport is deteriorating due to the insufficient facilities in the business districts and the lack of availability of road networks in the rural areas. At the national level, the growth of road network has not kept pace with the growth of the number of motor vehicles, creating severe traffic problems. Meanwhile, at the regional level (province, district, rural), the low network density as well as the unreliable and poor access to existing network has hindered the poverty reduction and growth in the isolated remote areas. The road quality is also uneven across country in Indonesia, ranging from relatively high condition of the national and provincial roads to poorly maintained sub-national roads.

Like in the road transport, the condition in the railways sector has also deteriorated in recent years, with available access only in Java and limited areas in Sumatra. The railways facilities are in poor condition. Many of the rails, bridges, signal and telecommunication system have exceeded their technical age limits. Compared to other transportation modes, the market share of railways in the transportation sector is very small.

2.2. Airports, sea-ports, and inland waterways

Although the air transportation in Indonesia, particularly the scheduled domestic air

transport, has recently significantly increased, the quality of air transportation facilities has lagged behind. Airports management in Indonesia has also remained below the required international standard of air transportation operation.

Generally, there are two kinds of ports in Indonesia, i.e: public ports and special ports. Public ports consist of commercial and non-commercial ports and are intended to provide service to the public. Most of the non-commercial ports, meanwhile, are designed to carry inter-island passengers and non-container cargoes.

Many non-commercial as well as commercial ports suffered loss recently although the commercial public ports, in particular, are defined by their ability to generate their own revenue. To cover their operational and maintenance cost, the government implements cross subsidy schemes among the commercial ports. Meanwhile, in the case of non-commercial ports, the government directly subsidizes these ports in order to ensure their public service role.

In Indonesia, as required by the Indonesian Shipping Law (UU.No.21/1992), the Indonesian Port Corporations (IPCs) have been granted authority to manage the operation of commercial ports. The IPCs are obligated to supply public services and generate revenues for the government. In order to maintain the financial sustainability of whole organizations and fulfill the obligation to the public, the IPCs are required to subsidize each other. Consequently, this environment creates a disincentive in advancing their performance. In addition, the monopoly power has aggravated the slow improvement.

Meanwhile, the tariff setting system is set by the IPCs, with evaluation from the Ministry of State-Owned Enterprises, Ministry of Transportation and Ministry of Finance, and approval from the Parliament. Such tariff setting mechanisms produced quite similar final tariffs across the IPCs' entire branch, especially for ports within the same IPC. However, these tariffs might not reflect efficiency because the lack of competition inside ports and the cross-subsidy system arranged by the government create a disincentive to improve IPC services.

These problems, i.e., cross subsidy, monopoly power/lack of competition, and the poor mechanism of tariff setting, have resulted in inefficiency in the Indonesia ports, hampered the port users, and created a high cost economy

2.3. Telecommunication

Up to this moment, fixed and mobile telecommunication business in Indonesia is dominated by few large operators. The high growth in wireless and fixed-wireless services has significantly increased the access to telecommunication in Indonesia. This is partly caused by the decrease in mobile telecommunication tariffs, lower price of handset, seemingly unceasing advancement of cellular technology and major investments. However, the fixed-line services have grown slowly, particularly given fixed-wireless substitution.

The rapid expansion of Indonesia's telecommunication sector has resulted in a significant increase in the industry's revenues and Indonesia's teledensity, albeit still

lagging behind its regional neighbors. Furthermore, although telecoms infrastructure coverage has increased, the access has not been distributed equally across country. In 2005, while the penetration rate in Metropolitan Jakarta (Jabotabek) region was the highest, around two thirds of the villages, particularly in eastern Indonesia, still had no access to telecommunication network.

In the same vein, although the competition among internet service providers in terms of price, quality of service and network coverage, and growth in the WiFi has increased recently, the access to internet services has also still lagged behind, with dial-up being the dominant means of access and access to broadband (cable, DSL) still very small. This limited internet access is associated with the lack of fixed-line, the low dispersal of personal computers, the extremely high (monopolistic) price of leased lines and international bandwidth, and the narrow coverage and inadequate capacity or limited bandwidth of terrestrial backbone infrastructure, especially in Eastern Indonesia.

It is estimated that the access in telecommunication services will improve in the mediumterm and the services provided will be more varied. In addition, it is expected that the future will witness an increasing demand for mobile voice and data services. As the cost/minute of 3G technology becomes lower and improvement in its additional broadband capabilities increases, it is estimated that the 3G services will play an important role in improving the development of the telecommunication sector in Indonesia.

2.4. Electricity

The power sector in Indonesia is a monopoly market, with Perusahaan Listrik Negara (PLN—National Electricity Company) as the sole supplier of electricity to the public and business. Although some private electricity operators exist, they are only allowed to sell their electricity services to the public through PLN. To carry out its duty as single producer, PLN has two wholly-owned subsidiaries for electric generation. The first is Indonesia Power which is built for commercial mission. The second is Pembangkitan Jawa Bali (PJB), which is established for social mission. In addition, PLN has also created 6 Strategic Business Units (SBUs). One of these SBUs is used as a transmission company (P3B) while the rest are utilized as distribution companies. Other retail operations are carried by retail business units.

As the economy began to recover, the power demand has risen, especially since 2000. Available system capacity, however, has grown in a slower pace to meet this increasing demand, resulting in low reserves with some power shortages across the country. This condition has created a concern on the reliability of power supply in the shortterm as load-shedding and blackout are frequently occurring, particularly in the islands outside the Java-Bali system. Moreover, the fuel subsidy reduction has also induced some 'captive power' producers to revert to utilizing power from PLN, which will further raise PLN's demand growth.

Meanwhile, the electricity access in Indonesia is still low, with wide disparities across provinces and those outside Java-Bali lagging behind. There are over 70 million people

in Indonesia, mostly the poor, who still do not have access to electricity. To attain 95 to 98 percent electrification rate just in Java-Bali, where expanding the electricity access will mainly be within the existing supply and distribution network, is estimated to need about 13-15 years. Thus, if PLN (or its successor) continues connections at the present pace, it is estimated that Indonesia's overall electrification rate will not meet 100 percent in the near future.

2.5. Water and sanitation

Basically, the structure for water supply and its distribution in Indonesia can be described in terms of three fundamental different types of provision. They are utility provision, self provision and alternative provision. In practice, a combination of two or three provisions could happen in one household. This is to fulfill the persisting needs for water and to get the most efficient provision at a particular time.

In Indonesia, water utilities are managed by local governments through their public companies called Perusahaan Daerah Air Minum (PDAM). There are 307 PDAMs throughout the country. Many of these companies are still under financial loans from central government because of the lack of investment for developing and advancing their businesses.

Water services in every urban area in Indonesia are in crisis at the moment. Currently, there are about 85 million people living in the service areas of the water utilities, 35 percent of which are served. This means that government is facing a larger challenge to create better and more adequate water services in the coming years.

In the same vein, sanitation service is much worse than water supply service. Up to now, sanitation services are not managed by any formal institutional structure at the national level. There is no ministry or department responsible for sanitation policy or designated to lead a national sanitation campaign. Basically, local governments are just doing an action-reaction policy which means to create action after reactions over unsatisfied sanitation service arise.

Sanitation service is primarily provided by three groups: (a) utilities, (b) self provisioning from users, and (c) alternative service providers. Any city or village may have more than one type of these groups because of the different types of policy implemented by the local government. Moreover, local government financial capability will heavily influence the policy on sanitation service.

Currently, 73 percent of urban households are estimated to have on-site sanitation, mostly in the form of septic tanks. Unfortunately, many of these are not functioning effectively or are violating the conditions for healthy sanitation system.

Indonesia has one of the lowest rates of urban sewerage coverage in Asia. Only less than 10 cities have some form of network sewerage and these reach as few as 1.3 percent of the urban population or about 200,000 households. Due to the lack of formal (public or private) networks and infrastructure, household and small-scale operators provide the majority of service, including installation and removal.

3. RECENT INFRASTRUCTURE DEVELOPMENT INITIATIVES AND PLANS IN INDONESIA

Because the condition of infrastructure in Indonesia has been deteriorating since the financial crisis, the policy to improve infrastructure has been one of the priorities in the past few years. In order to revitalize the infrastructure conditions in Indonesia, the Government of Indonesia (GOI) has initiated some policy initiatives and plans for infrastructure development, including the introduction of several sectoral reform initiatives, the holding of infrastructure summits in 2005 and 2006, the launching of infrastructure packages, and the introduction of regulatory and institutional reforms meant to attract public- private partnership (PPP) in infrastructure.

Below is the detailed explanation of these policy measures.

3.1. Sectoral reform initiatives

Since the crisis, the GOI has taken a number of sectoral reform initiatives. In the electricity sector, the GOI issued a modern electricity law in 2002, prepared some implementing regulations, increased electricity tariffs, and established the Independent Power Producers.

In the oil and gas sector, the GOI passed a new oil and natural gas law to enhance downstream competition and market pricing. In the telecommunication sector, the GOI also adopted a new law in 1999 to encourage the competition in all market segments. Meanwhile, in the water sector, there has been significant progress in the

implementation of a debt work program for PDAMs.

Despite the importance of the reforms, however, the overall effect has been relatively limited. There are several reasons that hindered in making these reforms fully effective. First, the objectives of reforms are either not clear or not single, with no specification on what the main and secondary objectives are. Second, the supporting regulations and institutions are frequently unavailable, long delayed, or not carefully designed, resulting in ineffective reform or creating uncertainties. Third, the reform had to face some challenges and opposition from other institutions that have different ideological views and vested interests such as the incumbent SOE monopoly or local governments. Fourth, determining the appropriate pricing policies is always becoming a problem due to the conflict between 'user pays' principle and political reasons.

3.2. Medium Term Development Plan in infrastructure

Recently, the government has prepared the development plan for infrastructure in Indonesia for the period 2005-2009. The plan aims to improve the maintenance of water, transport, electricity, telecommunication, and housing facility; to optimize sources of infrastructure funding from national and local budgets as well as from the private sector. This plan comprises six main sectors: Water Resources, Transportation, Energy, Telecommunication, Housing and Electricity.

3.2.1. Water Resources

Government plans to complete the water infrastructure regulation according to the good

governance principles. This institutional reform should follow a principle of one integrated management and single consolidated planning to comprise a central as well as regional authority. Government also plans to provide and increase the water accommodation capacity used for clean water consumption and irrigation. Hence, the government also needs to seek ways to keep the sustainability of water resources.

3.2.2. Transportation

The government plans to improve the maintenance of transportation facilities, to develop the standard and quality of infrastructure, and to support the private sector participation in infrastructure provision and operation. In road network, government plans to increase the paved road network and toll roads and to support interregional transportation and distribution. In airport and sea port development, government plans to improve the management system and to implement the electronic data interchange system to all fields related to the port. It also plans to enhance the cooperation with international airlines and sea lines to ease the international mobility.

3.2.3. Energy

In energy, government focuses on seeking ways to preserve the energy sources and ensure their sustainability, tries to find sources of new alternative energy and ways of converting them into usable energy form for the people. Government also plans to reform the existing regulation to make it clearer and more comprehensive. Government likewise plans to be more active in attending international forums and to take a more significant role in the decision- making process on global energy issues.

3.2.4. Telecommunication

In telecommunications, government plans to focus on increasing the access to telecommunication services and on advancing the quality of infrastructure provision on telecom. National government also plans to develop a new form of cooperation involving the local government and private sector through Build, Operate and Transfer (BOT) schemes. In business competition, government plans to create a more competitive business environment by eliminating barriers to entry for new potential entrants. Finally, government also intends to complete and finalize the cyber law and other regulations related to freedom on information.

3.2.5. Housing

The government focuses on housing provision, particularly for the poor, and on schemes that affirm the security and tenure of land ownership.

3.2.6. Electricity

Government has set its priority to build a new power generator using local energy resources in order to provide more accessible electricity services, particularly for the people in remote areas. It also prepares a cross- subsidy mechanism in the electricity tariff for the poor people. Finally, the main challenges in the electricity sector are to increase the efficiency of the national electricity company and synchronize the central-local regulation in order to create a competitive investment climate.

3.3. Infrastructure Summits I and II

While the institution and regulation remained weak, the GOI initiated several attempts to encourage investment in the infrastructure sector. The first government initiative was the holding of an Infrastructure Summit to attract private investment participation and to recover the low rate of private investment experienced since the crisis. In this summit, the private investors were formally offered 91 infrastructure projects valued at more than US$ 22 billion.

While this summit achieved great enthusiasm (oversubscribed) from domestic and foreign investors, the final result in terms of actual commitments was very disappointing. By the end of 2006, there were only six winning bidders announced and only one project has begun construction. It seems that the Coordinating Minister did not have a clear strategy regarding the 14 required regulations, risk guarantees, and pricing policies.

Given the lack of progress on the private- public partnership (PPP) attained in the first infrastructure summit, the GOI held a second infrastructure summit in November 2006 and resized back its list of critical infrastructure projects to 10 ‘model projects’ worth approximately US$4.5 billion .

3.4. Infrastructure packages

In 2005, the GOI introduced infrastructure packages that consisted of action plans and deliverables to create a policy framework that included: (1), inter sectoral (cross

cutting) policy reform; (2), sectoral and corporation policy reform to create a competitive climate in infrastructure provision; (3), regulation to eliminate the monopolistic activities and to protect society and investor interest; and (4), task allocation for the minister/governor/head of the agency functioning as the policy maker and the SOEs as operator. The preparation of the packages involved technical departments of the National Planning Agency, Coordinating Ministry for the Economy and the National Land Agency.

This infrastructure package includes plans for continued progress on public- private partnerships, including a risk- sharing framework, improved coordination mechanisms and progress on sectoral issues in anticipation of an Infrastructure Summit.

To eliminate discriminatory practices and to separate policy-making, regulatory, and operational responsibilities, the government also introduced another "Infrastructure Policy Package" in February 2006. The packages reported 50 policy outputs (laws, regulations, policy papers, and reviews) achieved in 2005 and further expected 153 additional policy outputs to be achieved in 2006. Three remaining policies are to be implemented in the first quarter of 2007.

The infrastructure policy in 2006 covers four main areas: (1) cross-sectoral strategic policy framework; (2) sectoral policy; (3) regional government role; and (4) infrastructure project transactions. One of the crucial areas in infrastructure is its cross-sectoral issues, particularly related to the financing issues. Through these policy packages, the government aims to finalize the policy framework and regulation in

transferring the fund from capital market or non-bank financial institution to the allocation of infrastructure projects that financially qualified.

In 2007, the government issued a presidential instruction as a continuation of the policy packages in 2005 and 2006. The policy packages aim to accelerate the programs for the Development of the Real Sector and Empower Micro, Small and Medium Enterprises to help increase the growth of the Indonesian economy. Unfortunately, up to this date, only two out of 41 action plans have been successfully carried out as of June 2007. One of the implemented action plans is the acceleration of land provision for public interest aimed toward settling the land dispute for infrastructure provision faster. Another implemented action plan is the revision of the government regulation on task allocation of local and central government in infrastructure provision. Meanwhile, revision of the transportation law is still being discussed at the parliament.

3.5. Regulatory and institutional reform for PPP scheme

The government has taken significant measures in 2005-2006 to improve the environment for private sector participation in infrastructure. In November 2005, the government passed Presidential Regulation no. 67/2005 (Cooperation between the Government and Private Entities in the Provision of Infrastructure) which revoked the previous Public-Private Partnership (PPP) Law. PP no 67/2000 aims at reducing information asymmetries so that the technical and financial capabilities of the bidders can be more accurately measured and the technical and economic merits as well as the financial risks of projects can be clarified.

The new regulation provided for a transparent and accountable basis for PPP in infrastructure and required that the procurement of PPP concessions is done on a competitive and transparent basis. It requires government entities to observe due diligence and focus on the aspect of fiscal sustainability. One of the key provisions of the new PPP regulation deals with risk management. It sets out the general principle that project risks will be allocated between the government and investors on a case-by-case basis. The government would thus not provide blanket guarantees in order to avoid the moral hazard risk on the investor's side.

In May 2006, the government passed Ministry of Finance (MoF) Regulation no. 38/PMK/2006 on the Technical Directives for Controlling and Managing Risks of Infrastructure Development. Under this regulation, compensation may be granted by the government for three types of project risk: political risk, project performance risk, and demand risk.

In October 2005, the government established the Committee for the Management of Risks of Infrastructure Provision to help the Committee on Policy for the Acceleration of Infrastructure Development (KKPPI) in evaluating the case for the government to share project risks after fulfilling the affordability and transparency criteria. Related to the provision on government support to private infrastructure, the government plans to launch the Infrastructure Guarantee Fund by mid- 2007 to provide necessary financing to cover government guarantees that have been approved by the MoF.

Realizing the fact that many infrastructure projects involving the private sector have been stalled due to land acquisition delays, the government passed a regulation providing for the mechanism in acquiring land and the compensation to be given to owners of land needed for infrastructure development. The government also proposed to set up a land acquisition fund to be established as part of the State Budget. This fund would be used to compensate owners of land needed for infrastructure projects.

Despite the progress, a number of challenges to achieving major infrastructure investments with the support of the private sector remain to be solved such as the realignment of government functions to fully support the new PPP regime and the development of domestic capital markets to mobilize long-term domestic infrastructure funding sources. Overall, the government seems to depart from an ad hoc approach toward a more strategic vision and planning in infrastructure development.

4. IMPORTANT ISSUES IN INFRASTRUCTURE DEVELOPMENT IN INDONESIA: CROSS SECTORAL ISSUES

In addition to sectoral solutions, comprehensive cross- sectoral solutions are also needed to improve the infrastructure condition in Indonesia. These cross- sectoral issues are related to institutional problems, financing problems, pricing problems, and competition, corporatization and privatization problems. The next sections give a detailed discussion of these issues.

4.1. Institutional issues

Institutional settings in Indonesia have changed dramatically due to the decentralization process which was launched in 2001. As a result, an exceptionally broad range of functions were shifted from the central to local government. Under the laws, all public service delivery functions, except defense, foreign affairs, monetary and fiscal policies, trade affairs and legal system, have been devolved to the local governments.

In theory, decentralization can deliver efficiency gains since local government is supposed to better understand the needs of local demands (allocative efficiency) and be able to deliver them at lower costs (productive efficiency) by using local resources. In practice, however, these gains depend on the effective coordination among tiers of government (regional coordination) and accountability mechanisms.

Several unfinished items in Indonesia's decentralization agenda are unfortunately very much related to the above conditions. First, assignment of government functions remained unclear. Second, minimum standards of service for obligatory functions are still being formulated. And third, the new intergovernmental fiscal system has several shortcomings, to wit: (1) the system is highly unequal since inequalities of the past system were compounded by those resulting from natural resource sharing, (2) because the local revenue generation capacity of regional governments is relatively small[1], almost all regions remain highly dependent on central government transfers, thereby limiting local accountability and increasing fiscal risks to the central government, and (3) due to lack of strong revenue sources, some regions are imposing taxes and

[1] Around 90 percent of regional government spending financed through central government transfers.

levies that are inconsistent with prevailing laws and regulations. All these shortcomings have left many regions with very limited funds available for infrastructure provision after meeting their wage bills.

Despite the fact that the Government of Indonesia has clarified the unclear assignment of government functions with government regulation, the regulation still creates uncertainty as to which level of government is responsible for the provision of various services. The situation is exacerbated by the fact that some decentralization implementing regulations are inconsistent with others as well as with existing national sector regulations.

By transferring the bulk of functions and/or financial resources to the lowest tiers of local government (rural districts/kotas and kabupatens), decentralization in Indonesia has largely reduced the functions of middle-tier levels of government (provincial government). Provincial governments in Indonesia lack the hierarchical authority over rural districts and this lack of regional coordination already causes inefficiency in service provision. The missing middle-tier levels of government can jeopardize the benefits of decentralization in the presence of economies of scale or spillover benefits in infrastructure service provision[2].

At the national level, integration of planning and coordination of implementation poses great challenges since decentralization was launched. The power of Bappenas and the

[2] George E. Peterson and Elisa Mizzini, "Decentralizing Basic Infrastructure Services"

Coordinating Ministry of Economic Affairs, which used to play a key role in inter-agency coordination, has now been significantly diffused to the local government and the MoF[3]. As a result, no institution is responsible for strategic vision and planning.

To respond to the increased need for effective inter-agency coordination, the KKPPI was established to fulfill the coordinating role among line ministries. The KKPPI recommended the establishment of several sector-specific committees, all of which are meant to create an ideal institutional arrangement for a PPP framework.

However, as briefly mentioned above, in many sectors, these functions have not been fully unbundled[4] in order to phase out the monopoly of SOEs in the provision of infrastructure services in these sectors. In some cases, line ministries still have policy making as well as regulatory responsibilities. In certain sectors, regulatory bodies are still performing the contracting function. In cases where regulatory bodies have been formed, they are still not perceived to be functionally independent.

While it is too early to measure overall impacts of decentralization on infrastructure performance in Indonesia, the World Bank (2003)[5] has expressed concerns that

[3] The 2003 State Finance Law The 2003 essentially shifted the national planning model—practiced during the New Order Government to medium-term expenditure framework model that emphasizes annual agency work programs and budgets not requiring Bappenas's approval.

[4] While in fact the Government has enacted new laws for toll roads, water supply and sanitation, the draft laws for ports, airports and railroads have been submitted to the parliament

[5] World Bank, "Indonesia: Selected Fiscal Issues in a New Era", Report 25437-IND, Washington DC, 2003

maintenance of some existing infrastructure projects has suffered a downturn due to unclear assignment of government functions and shortcomings in the intergovernmental fiscal transfer.

4.2. Financing issues

Fiscal space for infrastructure has been very limited in the last few years due to government's fiscal consolidation. Hence, significant infrastructure backlogs have emerged. Since 1997-98, public spending has declined and private investment has virtually been halted due to weaknesses in the investment climate. Conversely, the government is aiming to increase infrastructure investment spending from 20.5 percent of GDP (recorded in 2005) to 28.4 percent of GDP within five years (medium term) to achieve the goal of accelerating the annual GDP growth to 6.6 percent, considered to be the sustainable growth rate to boost job creation in Indonesia.

Therefore, the key challenge for the government is to invite domestic and foreign private sector investments as well as official development assistance to fill the financing gap. Currently, the World Bank estimated that only 20-25 percent of total investments (not limited to infrastructure sector) were contributed by private sector in Indonesia. The government attempts to stimulate private investment through a series of policy, institutional and regulatory reforms.

To attract private sector participation is a difficult task because it requires a number of enabling factors like creating proper incentive frameworks to encourage further private investment and empowering the judicial system and capital markets to bring better

corporate governance. In addition to these, the decentralization program launched in 2001 has created uncertainty about inter-jurisdictional responsibilities (see part 4.1. above).

4.3. Pricing issues

In the infrastructure sector, tariff is usually controlled by the government. This intervention usually takes the form of tariff control. There are many reasons for this tariff control. First, the government is frequently reluctant to increase tariffs to a level required for cost recovery although they may want to secure a certain level of service. Second, providing government subsidies to make up the difference may be banned by fiscal constraints. Third, vested interests of the groups who benefit from a lower price may also hinder government from raising the price.

An adequate tariff level is an important factor for sustaining infrastructure services because it is needed to maintain the financial feasibility of the providers of infrastructure services. In turn, this is important so that the providers are able to sustain the quality of the infrastructure services delivery to the consumer at the most efficient manner. Consequently, the service providers are required to be able to recover their cost. A service provider can attain cost recovery through three ways, namely: through user charges by charging those who use the service, through general tax revenues or through international donor funds. The cost recovery charges can be coursed through the consumers (via user charges) and domestic or international tax payers (via subsidies).

In order to secure the financial feasibility of infrastructure services, the implementation of the "user pays" principle that requires the consumer or tax payers to pay at the minimum tariff for operation and maintenance is crucially needed. If this principle fails to be applied, it is possible that the service providers will reduce their maintenance and/or expansion, which will eventually lead to low access and deteriorating service quality. Since the user charges are a main source of infrastructure financing, the failure of government to set the cost-reflective tariff, particularly during high inflation period, will produce underinvestment, thereby leading to a deteriorating infrastructure performance.

Authority to set tariffs is typically vested with the President and is entirely discretionary while sector departments commonly combine the roles of policy-maker, regulator and shareholder representative. The GOI has long been maintaining the level of tariff below the level needed to cover the maintenance cost or support new investment. Meanwhile, the sharp depreciation of the Rupiah in 1997-98 and the subsequent increase in inflation raised the cost structure of infrastructure services. Although there have been several attempts to adjust the tariff, the tariff adjustments have often been either too little or postponed. Fear of social unrest and its political consequences have prevented the GOI to bring tariff up to its recovery cost level.

Consequently, as explained above, since the crisis, the public investment in infrastructure in Indonesia has declined and the quality of infrastructure services has deteriorated, with the water and electricity sectors being in the most troubled situation. The current low tariff, especially in PDAM and PLN, is not only inadequate to fund

operational and maintenance costs but also undermines the financial position. This eventually restricts the financing of the network expansion.

Meanwhile, the private sector will not be interested in providing infrastructure services unless it can be confident that its revenues will exceed it costs. In order to mobilize investments from the private sector, the GOI has been forced to deal with the sensitive issues of tariff. However, tariff increases will often be opposed by many consumers. As a consequence and due to political reasons, the GOI is usually reluctant to increase the tariff, either by prices scheduled or tariff postponed. It has subsequently led to concerns among existing and potential investors regarding government's commitment toward financial feasibility in infrastructure. Subsequently, this leads to a low level of private investment in infrastructure, and thus, to further deterioration of the access to and quality of infrastructure services.

While maintaining below-cost tariff is originally aimed to protect the poor people, it is actually not the appropriate policy. Ironically, the low tariff has resulted in poor access to infrastructure facilities and in low quality of the infrastructure services. Eventually, it is the poor people, who are in need of proper infrastructure to help reduce poverty, who suffer from these inadequacies. To make the poor people have a chance to benefit from infrastructure services, the GOI may provide well-targeted and financially sustainable subsidies for the poor.

4.4. Competition, corporatization, and privatization issues

Vertical and horizontal integrated state monopolies under ministerial control are usually found in the case of network utilities. Due to the economic as well as social importance of infrastructure and the fear of abuse of private monopoly, the government could not fully trust the market mechanism to control these services.

Moreover, the Indonesian Constitution states that the State has the authority to control every productive activity that affects the lives of the general public. This statement was long interpreted to mean that the public sector has exclusive right to provide the infrastructure services. The State-owned enterprises (SOEs) have been granted extensive monopoly power by law; thereupon, the provision for economic regulation has been given little attention.

Consequently, the government agency usually has been granted full control over every aspect of a utility. Nevertheless, lack of competition and regular political intervention have caused low productivity, declining fixed facilities and equipment, poor service quality, revenue shortage and inadequate investment so that in the end, these lead to infrastructure deficit and hinder economic growth.

These conditions have induced the government to invite private participation in enhancing the efficiency, promoting innovation, and improving the service quality. Private entities are believed to be superior in terms of financial, technical, and managerial resources over state agencies in the rapidly changing markets and

technologies of network utilities. However, a series of financial crises, corporate scandals, and electricity blackouts have required more comprehensive institutional reform, involving a combination of competitive restructuring, corporatization, privatization as well as regulation. In this wide-ranging reform, harmonizing the role of private and public sectors is an essential part of every infrastructure reform program.

As a result, inefficient, unresponsive, corrupt and heavily dependent on government for their financing have become common characteristics among many state- owned enterprises. Since sector departments have often considered the SOEs as under their authority, SOEs have often been exploited by them in terms of budget support and jobs for the senior staff.

To enhance the SOEs' performance, the GOI has, since the early 1980s, attempted to commercialize, corporatize, and privatize the organization and operation of public infrastructure. The reforms have also been advanced in the form of unbundling some national and regional monopolies,

Moreover, to support the reform, the GOI has also divided the responsibilities for sector policy formulation, regulation and SOE ownership. This has eventually led to the establishment of a Ministry of State Enterprise (MOSE). As a consequence, the sector ministries' ownership on SOEs or their shareholder functions was transferred to the MOSE. This change, to some extent, has improved the corporate governance as well as corporate cultures in SOEs.

5. POLICY IMPLICATION

5.1. Sectoral recommendation

5.1.1. Roads and railways

In order to ensure the sufficient maintenance and extension of road networks, the central government can arrange and provide fiscal incentives to provinces and district government. This can be made, for instance, by setting a prerequisite on sufficient maintenance level within regional governments for central government co-financing of provincial and district roads network.

The GOI should build appropriate project parameters consisting of procedural arrangement for land acquisition, toll-rate escalation, and specific project risks. These clear project parameters are required to prevent the conflict over the form and level of government support that hindered private participation in the development of toll-road network

The PSO system, particularly in form of low tariff, in railways sector has burdened the financial condition of PT Kereta Api Indonesia (PT KAI). In order to tackle this problem, the government should either proportionally reduce public sector obligation (PSO) required by the government or sufficiently cover the cost of PT KAI in providing PSO services.

5.1.2. Airports, sea-ports, and inland waterways

Like in other infrastructure sectors, privatization in the ports sector has been implemented gradually and partially. The privatization in the ports sector has been applied particularly in ports with high domestic and international trade activities and only imposed to several services.

This privatization scheme should be extended further to the other services provided at the ports. In addition, this kind of privatization should not be only applied to a provider that has good financial condition but also to those that could enhance the competitiveness of the port, utilize modern management and technology, and guarantee the transfer of knowledge to domestic providers. A direct joint arrangement and management between local government and private sector, which is derived from the public-private-partnership framework, may become an alternative form of privatization scheme for the improvement of ports services in Indonesia.

In addition, the government should also consider to proportionally reduce public sector obligation (PSO) required by the government and to abolish the cross-subsidy scheme obligation among IPCs.

5.1.3. Telecommunication

While the private investors may be unwilling to invest in remote and sparsely populated regions, the government should take the responsibility to provide the needed infrastructure. This can be done under the universal service obligation (USO) scheme.

Under this scheme, telecommunication companies will be invited to submit bids for village telecommunication projects and the company that asked for the least subsidy principle will get the project. In order to prevent poor quality and low access of telecommunication services, the government is required to arrange the criteria of technology that has be fulfilled by the bidder and the criteria regarding the proportion of households that should get access to telecommunication service in each village.

5.1.4. Electricity

While the vast amount required to meet the growth of electricity demand will remain to be carried out by the government, the fundamental principles of least-cost expansion should still be followed. In the case of fuel-mix decision, for example, in order to lead the fuel-mix decision to be based on its actual economic costs, the GOI is suggested to eliminate the distortion created by the current subsidies for oil and the different pricing for export and domestic gas.

The current tariffs should also be adjusted upwards and their structure should be reviewed to meet the actual cost of electricity delivery since the current subsidies are very inefficient as they lead to an unnecessary electricity consumption that tend to benefit the rich people. Moreover, the GOI should also abolish the on going government transfer to recompense for the difference between increased fuel prices and unchanged tariff revenue of the PLN. Furthermore, the GOI should also develop an appropriate plan for an orderly transition since the political cost and economic impact of dramatic changes in the domestic price are very high. Lastly, the subsidies should be allocated

for the network expansion instead of for consumption, and a different approach for every area should also be created as the PLN's cost varies for each region.

5.1.5. Water and sanitation

Decentralization has granted the sub-national government greater access to additional financial resources for infrastructure. This should provide local governments the chance to improve the maintenance of and investment spending for infrastructure. However, as the local governments take the central role in the improvement of infrastructure, including that of water and sanitation services, there should be actions to upgrade their capacities in order to match this responsibility. In this case, the central government can take a significant role in coordinating a national strategy and offering incentives for local governments.

In addition, a mechanism of fiscal incentives that rewards sub-national officers for the improvement in reforming their PDAMs and that gives a stronger signal regarding the national importance of water and sanitation should be developed by the central government. Initially, the incentive scheme should be focused on improving the financial position and operational performance of PDAMs. As the PDAM performance advances, the central incentive scheme could shift to extending the household network connection.

To support these schemes, the central government should continuously force the PDAM to provide reliable data. Furthermore, in order to improve the PDAM, its audited

accounts and physical indicators should be made available publicly through the internet so that they can be used for policy analysis and increased public awareness. The timely provision of these data by local governments can also be used as a prerequisite for involvement in the national incentives schemes.

5.2. Cross-cutting recommendations

5.2.1. Institution

Creating a sound and clear regulation is a necessary requirement to attract private sector involvement in infrastructure development programs since it can introduce economic efficiency, encourage innovation and provide incentives for the expansion of the infrastructure network. In addition, establishing a credible and independent regulatory institution is also important. In order to do so, the GOI is expected to grant the regulator with separate legal power, provide sufficient funding for the regulated industry and secure their positions through fixed-term tenure.

While decentralization has significantly altered the ways in which Indonesia is governed, further actions are needed to achieve the decentralization's ultimate goals. The GOI should reevaluate its role and the organization of each sectoral ministry as well as reorganize the arrangements for policy coordination and strategic planning. Moreover, the GOI should also (a) create a clear definition of the responsibilities of each level of government, (b) advance the financial transfer mechanism, (c) promote effective inter-sub- national cooperation, (d) upgrade the capacity of sub- national institutions, and (e) avoid imposition of improper taxes and levies.

5.2.2. Financing

To attract private investment in Indonesia, the GOI should establish a mechanism for defining and determining the various investment risks and develop a methodology to help decide which projects are suitable to carry out. During the development stage of the methodology, the MoF should be involved in order to ensure that the investment project is financially feasible and that appropriate measures to address potential risks are in place.

In the meantime, while it takes time to mobilize private sector investment, the GOI should also give larger attention to increasing public sector investment so that Indonesia's immediate infrastructure needs can be attained. Because of the vast amount of investment needed to develop infrastructure facilities, the private sector should be involved to carry the financing burden. However, due to the large amounts of money needed in infrastructure development, the private sector can not be expected to immediately prepare such projects. Thus, increased public sector investment is urgently needed to meet the immediate infrastructure needs.

The GOI should also provide substantial support to the private investment. This is important because even where private investment is able to be mobilized, most private infrastructure investment will require government support, including the land acquisition, operational or capital subsidies, or risk guarantee. However, when the government support is given, it is also important to make sure that the resources are utilized effectively and the risks are shared properly between government and private

investors.

Parallel to increasing the volume of infrastructure investment, the government should also enhance the effectiveness and efficiency of its spending. This can be done by creating a better public management. While the GOI has established a committee of government ministers -- the KKPPI -- in 2005, this institution should be directed to lead the improvement of policy framework for increasing investments in the sector.

The GOI should take further action to deal with corruption in public infrastructure projects. As suggested by Olken (2006), these efforts can be in the form of advanced risk-focusing of physical audits, increased transparency of the procurement process, sharper sanctions for firms and officials found guilty of corruption, and revised staff incentives.

5.2.3. Pricing

It is important to implement a carefully planned set of tariff reforms. The need for tariff reform should be clearly articulated to consumers in terms of the social consequences and distributional impacts. The new set of tariffs should follow the "user pay" principle.

5.2.4. Competition, corporatization and privatization

The government policies to promote competition, corporatization, and privatization of infrastructure have produced considerable progress in the performance of SOEs in infrastructure. Therefore, these efforts should continuously be consolidated and

extended.

The GOI should direct the market segmentation in the transportation sector in accordance with every transportation mode of competitiveness. The GOI should make sure that it does not protect a transportation mode that is not efficient. The privatization scheme is a useful means of improving enterprise performance but infrastructure reforms in this regard need to be carefully designed and implemented. The objectives of privatization should be clearly defined and then articulated to consumers in an effort to 'socialize' the reform measures. It is also desirable that any restructuring and rehabilitation needed to enable more effective competition along with adequate regulatory arrangements be instituted prior to privatizing SOEs.

Chapter 6: Infrastructure Development in Lao PDR

Syviengxay Oraboune

Abstract

Being a land-locked country with poor infrastructure has put a constraint to the socio-economic development of Lao PDR. In view of this, the Government of Lao PDR has introduced a "land-linked" strategy parallel to regional and sub-regional infrastructure development trends, especially in the frameworks of, among others, the ASEAN, Greater Mekong Sub-region, and Triangle Development Area. The strategy addresses the importance of infrastructure development, particularly the road/transport sector, as the means to achieve the 2020 vision for the country to graduate from the list of less developed countries (LDCs) and to eradicate mass poverty by 2010. Infrastructure development has been identified as significant both for poverty reduction and private sector development because of the following reasons. One, focusing on farm-to-market road construction with proper mechanism to link rural farmers to the growing demand within the country and in the region is significant for poverty reduction. Two, improvement of logistic infrastructure, particularly factory-to-port transportation, is critical in enhancing business performance, export development and economic growth. And three, widening choices for logistic transportation in the longer term of the infrastructure development strategy of the country will greatly boost growth and assist in the poverty reduction program.

INTRODUCTION

Lao People's Democratic Republic (Lao PDR) is the only land-locked country in the Southeast Asian region. This situation where there is no direct access to the sea and where poor infrastructure exists has served as a bottleneck to the development of this small domestic market of only about 5.6 million people (as of 2005) especially in the process of regional and international integration.However, because the country is located in the heart of the Indochina peninsula and is surrounded by approximately 246 million people from five countries, namely, Viet Nam (82) in the East, Cambodia (12) in the South, Thailand (61) in the West, Myanmar (48) in the Northwest, and China's Yunnan Province (43) in the North, its potential for development has emerged.

The Government of Lao PDR (GOL) launched the new economic mechanism (NEM) policy and introduced a market-oriented system for the country in 1986 in order to induce the socio-economic development of the country. After 1992 and 1997, with the country's participation in the Greater Mekong Sub-region (GMS) and the Association of Southeast Asian Nations (ASEAN), respectively, the process of economic integration of the country hasbeen dynamically assimilated within the region. The country has further raised its effort to be integrated at the international level with its current negotiation to access to the World Trade Organization (WTO). In view of this, the development of an efficient transport system is of paramount importance for the regional/international integration and socio-economic development of the country.

Private sector development is recognized as important in the process of economic integration but poor infrastructure has become an obstacle in the development of the

private sector as well as in the improvement of competitiveness of the country. The poor infrastructure system, together with the absence of the necessary logistics and the non-unification of the transportation system with neighboring countries, serves as a critical problem in the development of the private sector since it raises the cost of transportation, thereupon reducing the price competitiveness of Lao export products. This directly impacts on the overall development of the country.

Under regional and sub-regional cooperation schemes, therefore, the government of Lao PDR has decided to launch a so-called "land-linked" strategy by developing a domestic road system and link to neighbouring countries in order to gradually transform the obstacle situation to an opportunity for the country's development.

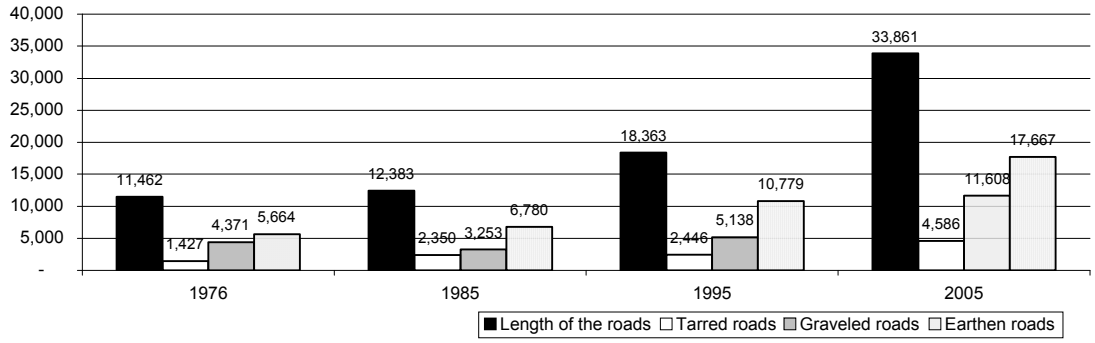
This report aims to provide an overall situation of the infrastructure development in Lao PDR through a review of the infrastructure development process in the country. The paper also discusses some important issues relating to infrastructure development in Lao PDR, including poverty reduction and logistic issue. It concludes with some considerations and policy recommendations for the development of infrastructure in general.

1. INFRASTRUCTURE DEVELOPMENT IN LAO PDR

Since gaining independence in 1975, the Government of Lao PDR has emphasized the importance of infrastructure development, particularly the road sector, as the key in the country's development. Playing a central role is the Ministry of Communication,

Transportation, Post and Construction (MCTPC) which has carried out the development of the road expansion in the country. In 2005, the total length of the road in Lao PDR increased to 33,861 km, from only 18,363 km in 1995 and 12,383 km in 1985. The increase was more than 3 folds in 30 years as seen in Figure 1.

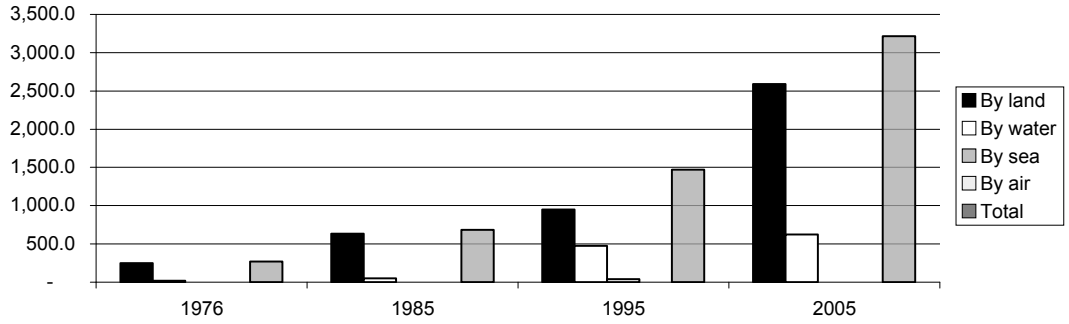
Figure 1: Length of Road in Lao PDR



Source: National Statistical Centre, 2005

The development of roads, bridges, waterways, airways and other infrastructures has supported the development of other sectors, including agriculture and commerce as it eased market access and improved the transportation, freight and transshipment of goods in the country. Road transport is the most used mode for freight transport, accounting for more than 80 percent of total freight transport in 2005. As the road transportation network was improved, however, other modes of transportation, particularly the waterways system, declined (Figure 2).

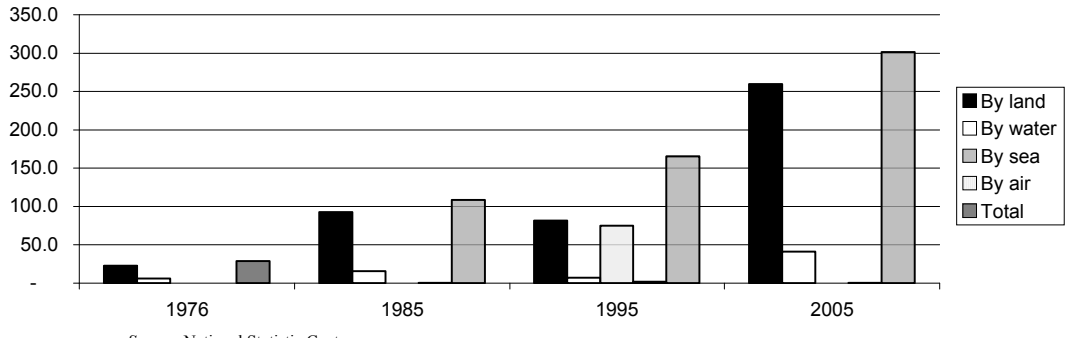
Figure 2: Freight Transport 1976-2005



Source: National Statistical Centre, 2005

Freight traffic almost doubled in the last 10 years since 1995 and had an almost 300 percent increase from 1976. More than 86 percent of this freight traffic, as noted earlier, was transported by road in 2005 (see Figure 3).

Figure 3: Freight Transport 1976-2005

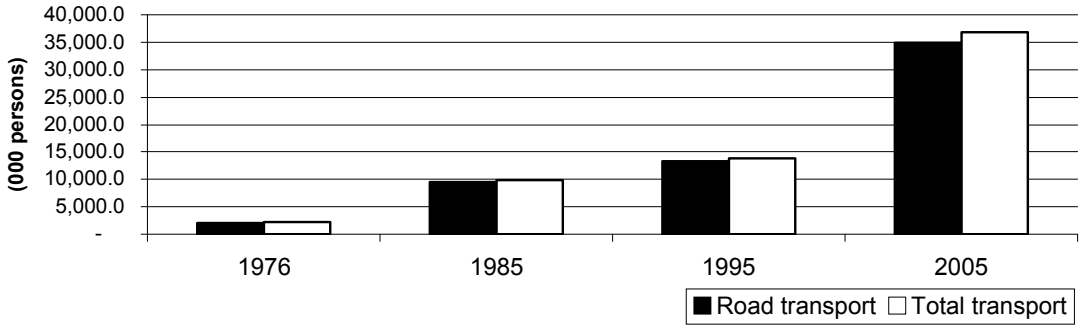


Source: National Statistical Centre, 2005

In 2005, total passenger transport in the whole country was about 37 million persons which increased more than 20 times in the last 30 years. About 95 percent of the people travelled by road as seen in Figure 4 although passenger travel by water also significantly increased. Still, though, the water transport mode nonetheless accounted

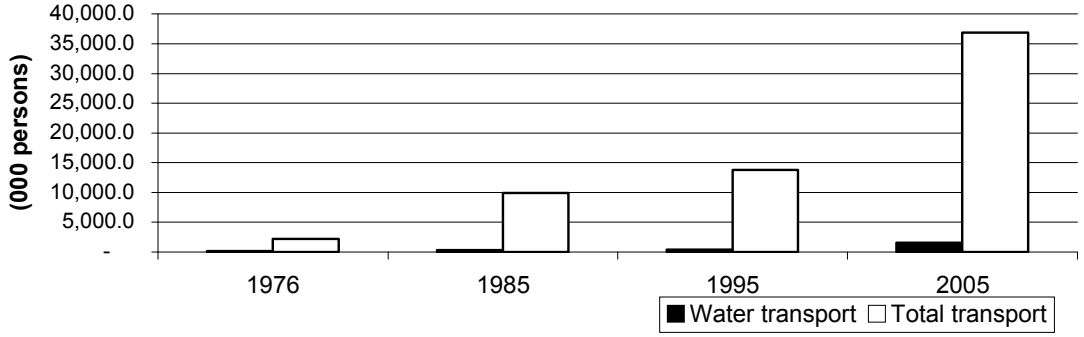
only for less than 3 percent (Figure 5).

Figure 4: Road Passenger Transport: 1976-2005



Source: National Statistical Centre, 2005

Figure 5: Water Passenger Transport: 1976-2005



Source: National Statistical Centre, 2005

1.1. Waterways (inland) and transportation

Most of the waterway transport system in Lao PDR were used for domestic services. Only the Mekong River had been used for international transportation with mainly neighboring countries such as Thailand, China and Cambodia. The Mekong River and some of its tributaries such as Nam Ou and Se Kong rivers flow through the country for

over 2,000 km. However, during the dry season, river transportation is reduced to only 1,300 km due to the rapids, falls and low water level.

Meanwhile, because of commercial activities with China, vessels up to 400 DWT can operate throughout the year in the northern section of the Mekong River. Elsewhere, however, travel is limited only to smaller barges of only 200 DWT or less. In the dry season, though, only small, shallow-draft, narrow-beam passenger vessels are used to navigate. Most of the higher capacity vessels are used to carry industrial and agriculture products such as sand, rock, wood products, food grains, steel products, logs, etc. At present, the waterway route in the northern provinces of the country plays a significant role for tourism development as many tourists prefer to travel by boat from Thailand to Lao PDR or by small ships along the Mekong River in the northern region.

On the other hand, in the central and southern regions, waterway transportation is not so popular especially after the development and expansion of the road network system such as Roads 13 and 9 as well as the completion of many domestic connecting bridges and international bridges such as the Lao-Thai Friendship Bridges 1 and 2. People prefer to travel by car rather than by other means of transportation.

1.2. Air transport

At present, there are two national air companies (state-owned Lao Airline and joint state-domestic private Lao Air) operating air transport domestically in Lao PDR. For international air flights, there are, besides Lao Airline, a few airline companies mainly from neighboring countries that provide air transportation services for international

routes to and from Lao PDR, including Thai Airways International which provides two flights a day to and from Bangkok and Vientiane, and Chiang Mai and Louang Prabang. Viet Nam Airline offers flight services to and from Hanoi – Vientiane – Phnom Penh – Ho Chi Min while China (Yunnan) Airlines has flights to and from Vientiane – Kunming – Vientiane.

Domestic services are operated exclusively by Lao Airlines and recently also by Lao Air although there is a privately owned and operated chartered helicopter service used mainly for aerial work and passenger transport to remote areas.

There are few domestic flights mainly between Vientiane and some provinces in the northern region, including Loungprabang, Xayabury, Xamneu, Phongsaly, Loungnamtha and Xiengkhouang. There is only one round-trip flight daily to and from Vientiane and Pakse after the flight to and from Savannakhet had been cancelled due to the improvement of National Road 13 South. In sum, there are about ten recognized minor airports located in the provincial capitals and thirty-nine other airports with unpaved runways.

However, only Vientiane International Airport and Loung Prabang Airport handle international traffic and provide basic customs, immigration and quarantine services. Pakse Airport is being planned to become a regional airport in the near future as it currently services the Vientiane – Pakse – Siam Reap (Cambodia) route daily and is expected to provide similar services later on. For the Savannakhet Airport, meanwhile, whose operation has been closed for some time now, it is expected that it will resume

business soon in cooperation with Thailand.

In the early 1990s, the government decided to establish an autonomous authority to manage the Vientiane Wattay International Airport. However, it is now back under the direct government management of the Lao Airport Authority (LAA) which is currently responsible for the management and operation of the airports in Vientiane, Luang Prabhang, Pakse, and Luang Namtha. The remaining minor airports are the responsibility of the provincial governments although the central government provides annual grants for their capital expenditures. The revenues and expenses of the LAA are part of the national budget, and its employees are governed by the terms and conditions applicable to government personnel. The Lao government obtains substantial revenue from international flight charges due to the high traffic volume in the following air routes that pass over Lao PDR airspace: Bangkok – Hong Kong, Bangkok – Manila, Bangkok – Hanoi, and Hanoi – New Delhi (Alberto Nogales, 2004).

Since the government undertook significant reforms in air transport sector, including privatization in airport and airlines operation, the Lao Airline business has gradually improved with significant benefits seen over the recent years. To further improve its quality of services, the company bought two aircrafts from China for domestic services and ordered two more aircrafts in 2007 (Vientiane Times Newspaper, 4 July, 2007).

1.3. Railways transport

The process of railway development in Lao PDR derives mainly from a feasibility study

of the Trans-Asian rail link. According to the studies, the rail route through Lao PDR that is parallel to Road 13-North would entail the least operational costs in linking the Thailand-China traffic. The main objective for the development of the railway system in Lao PDR is to enhance regional economic integration and ensure that Lao PDR would benefit from greater and easier access to regional markets.

In the meantime, the railway from Nongkai has been completely constructed and connected to the Lao-Thai Friendship Bridge. The construction of railway (3.5 km) from the middle of the bridge to Thanaleng was already agreed upon by the Lao and Thai governments to be funded by the Thai government with a total amount of US$4.9 million (197 million Baht). The funding of the 3.5 km railway has two portions, namely, 30 percent grant (US$1.5 million) and 70 percent soft loan (US$3.4 million) (Dr. Onnavong Bounta, 2006).

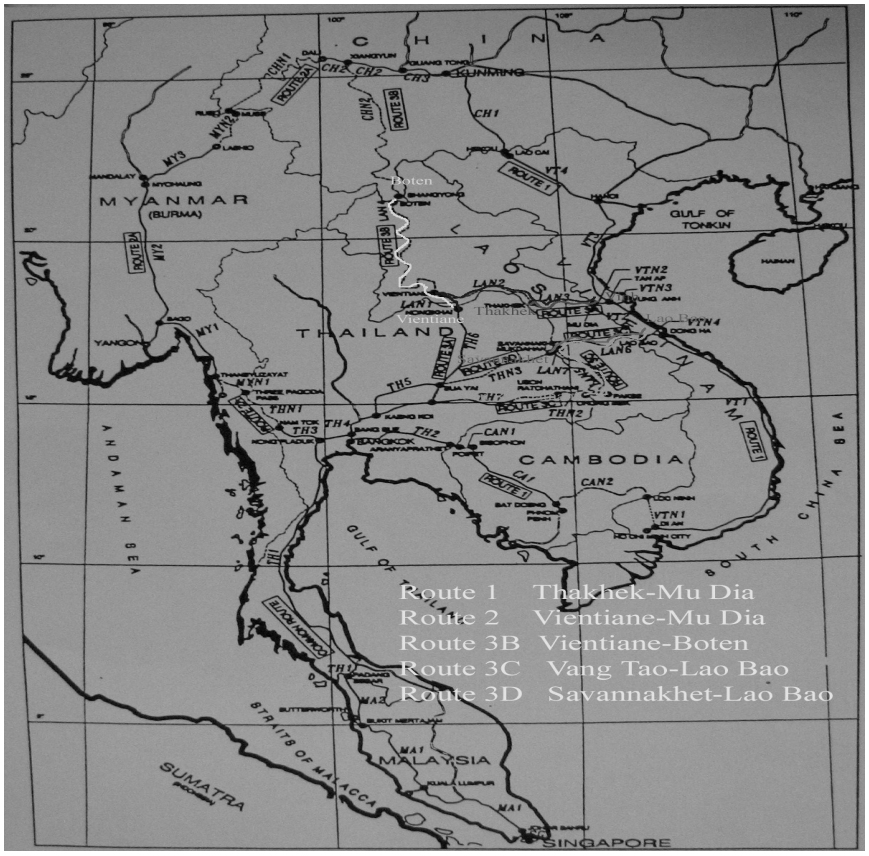
The project will be further developed from Thanaleng to Sokkham consisting of about 9 kilometers and supposed to be funded by France Development Agency (EU150,000). The pre-feasibility study of the railway route Vientiane – Thakhek – Mugia, however, which will connect to the Viet Nam Railway Network had already been carried out and completed and is now under a fund mobilization process (Dr. Onnavong Bounta, 2006).

Nevertheless, under the ASEAN initiative in 1995 that was aimed to develop a regional railway linkage between the ASEAN and Kunming of China, the so-called "Singapore-Kunming Rail Link" (SKRL) was introduced. According to the SKRL feasibility study team, several rail routes have been introduced as potential areas for the

railway development in Lao PDR. These SKRL routes, as seen in Map 1, are as follows:

- Route 1: Bangkok-Aranyaprathet-Poipet-Sisophon-Phnom Penh-Loc Niinh-Ho Cho Minh City-Hanoi-Lao Cai-Hekou-Kunming with a spur line to the port town Vung Anh from Tan Ap and another one to Vientiane via Mu Dia and Thakhek or from Dong Ha to Savannakhet via Lao Bao.
- Route 2A: Bangkok-Nam Tok-Three Pagoda Pass-Thanbyuzayat-Yangon-Lashio-Muse-Rueli-Dali-Kunming
- Route 3A: Bangkok-Nong Khai-Vientiane-Thakhek-Mu Dia-Tan Ap-(Vung Anh)-Hanoi-Lao Cai-Hekou-Kunming
- Route 3B: Bangkok-Nong Kai-Vientiane-Boten-Xiangyun-Kunming
- Route 3C: Bangkok-Ubon Ratchathani-Chong Mek-Pakse-Savannakhet-Lao Bao-Dong Ha-Lao Cai-Hekou-Kunming
- Route 3D: Bangkok-Bua Yai-Mukdahan-Savannakhet-Lao Bao-Dong Ha-Hanoi-Lao Cai-Hekou-Kunming

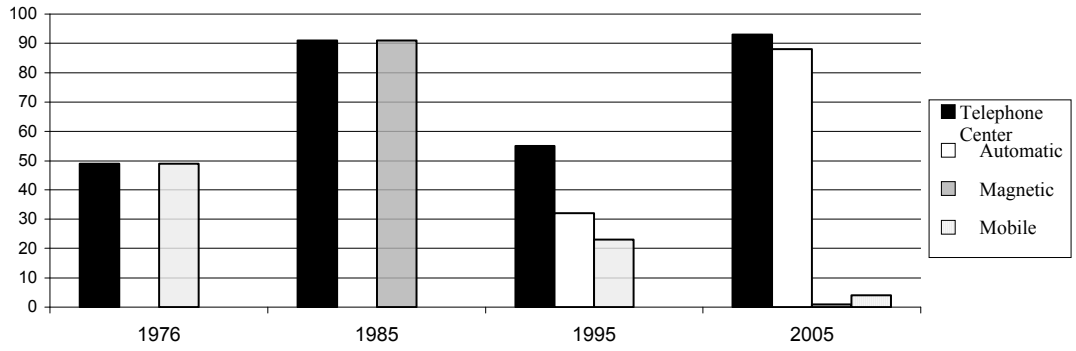
Map 1 : Singapore-Kunming Rail Link System (Feasibility Study)



1.4. Telecommunication sector

The telecommunication system in Lao PDR has gradually improved in the past 30 years. Telex, telegraph, fax and Internet services are available into and out of Lao PDR though mainly in the city and provincial centers. With the reform of the Lao Telecommunication Company (a state-owned company), the services of telecommunication have significantly developed and expanded especially in the 2000s. In 2005, for instance, almost all of the telephone centers in the country provide services with automatic system (see Figure 6).

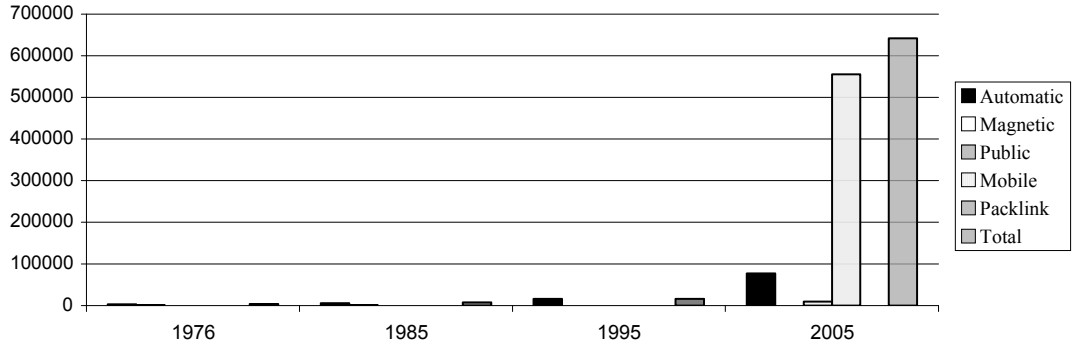
Figure 6: Number of Telephone Center 1976-2005



Source: MTCPC, 2005

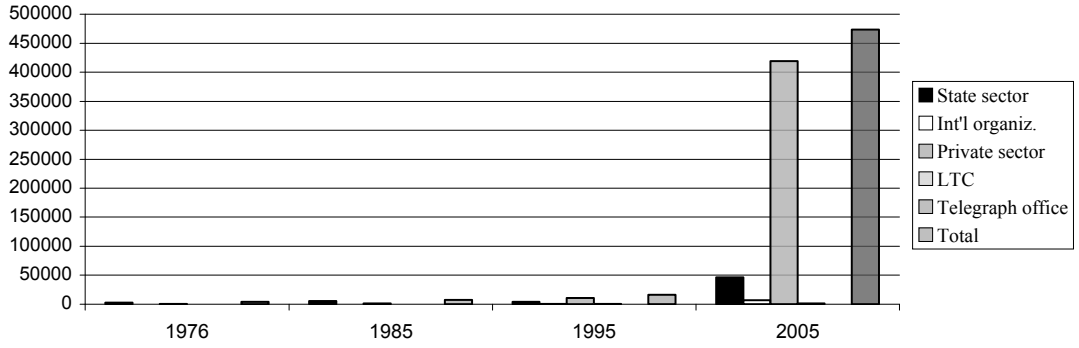
Since 2000, the number of telephones has dramatically increased, thereupon improving the telecommunication system in the country tremendously. Remarkably, mobile telephone has become a major mode used as mobile telephones accounted for more than 85 percent of total telephones. Moreover, almost 90 percent of these are privately used (Figures 7 and 8).

Figure 7: Number of Telephone 1976-2005



Source: MTCPC, 2005

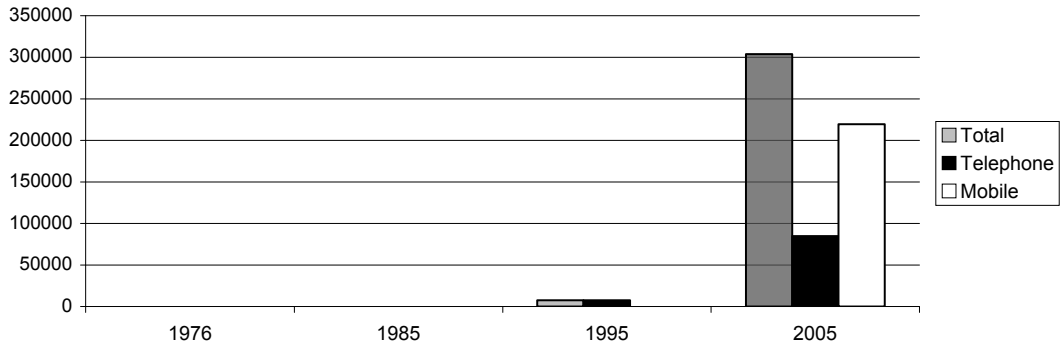
Figure 8: Number of Telephone by Sector



Source: MTCPC, 2005

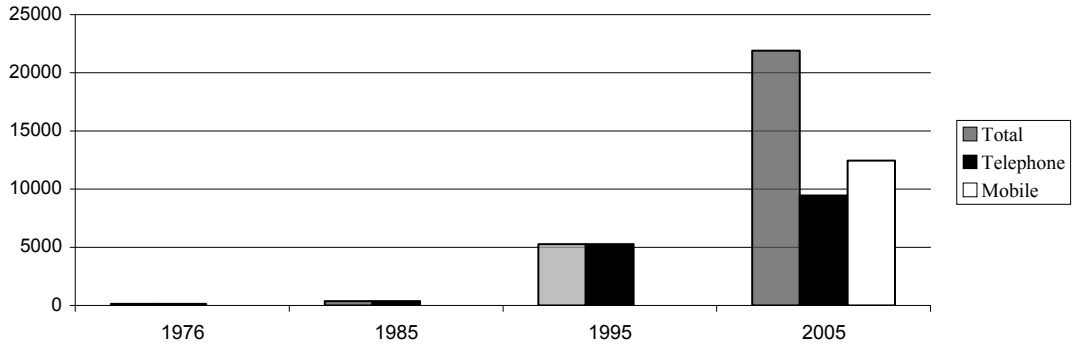
The telecommunication system further improved with the significant increase of service providers/centers, both public and private. Currently, there are five companies that provide mobile system services in Lao PDR. Three of them are privately owned and offer service coverage all over the country. With the improvement in the mobile system, the use of mobile phones accounted for more than 70 percent of total use of telecom production. Further, with the gradual decrease in service prices, the use of mobile phones has become more popular and more convenient (Figures 9 and 10).

Figure 9: Telecom Production 1976-2005



Source: MTCPC, 2005

Figure 10: International call 1976-2005



Source: MTCPC, 2005

1.5. Hydropower sector

Lao PDR has a total hydro potential of about 23,000 MW. At present, however, only 627 MW (as of 2002) of an estimated 18,000 MW of exploitable hydro potential has been harnessed (Electricity Du Laos). Since Lao PDR has extended its cooperation in the power sector to neighboring countries, the number of hydro power plants has increased. So far, more than 10 hydro power plants exist in Lao PDR with a total

capacity of about 644 MW, 627 MW (97%) of which is sourced from hydro and the rest (3%) from diesel (Table 1).

Table 1: Existing Power Plants in Lao PDR

No.	Plants (H:Hydropower)	Location (Province)	Max. Output (MW)	Production (GWh/year)	Owner	Comm-year
1	Theun hinboun (H)	Khammouane	210	1,620	IPP	1998
2	Nam Ngum 1 (H)	Vientiane	150	960	EDL	1971
3	Houay Ho (H)	Attapeu	150	617	IPP	1999
4	Nam Leuk (H)	Vientiane	60	245	EDL	2000
5	Xeset (H)	Salavane	45	181	EDL	1999
6	Selabam (H)	Champasak	5	34	EDL	1969
7	Nam Phao (H)	Bolikhamxay	1.6	7	Province	1995
8	Nam Ko (H)	Oudomxay	1.5	8	EDL	1996
9	Nam Dong (H)	Luangprabang	1	5	EDL	1970
10	Micro-hydro	37 locations	5.56	-	Province	-
11	Solar	106 locations	0.17	-	Province	-
12	Diesel	48 locations	17.34	-	Province	-
			644	3,677		

Source: Electricity consumption Statistic year 2001 (DOE, MIH)
Note: IPP: Interconnection Plan Project, EDL: Electricity Du Laos

With the opportunity provided under regional integration, particularly in the framework of the ASEAN and GMS as well as with the increased demand for energy, and in order to achieve the development objectives for the hydropower sector as identified in the Memorandum of Understanding (MOU) between Lao PDR and neighboring countries like Thailand, Vietnam and Cambodia, the Lao Government took the initiative to further develop its hydropower industry by adopting a long-term power development plan for hydropower up to 2020. According to the plan, there will be 19 projects located throughout the country with a total capacity of approximately 991 MW and annual energy of 4,493 GWh (see Table 2).

Table 2: The power generation development plan to 2020

No.	Project Name	Inst. Cap. (MW)	Annual Energy (GWh)	Compl. Years	Regions	Types
1	Nam Mang-3	40	147	2005	C1	EDL
2	Xeset-2	76	309	2006	S	EDL
3	Xepon	75	301	2008	C2/S	EDL
4	Nam Ngum-2	75	275	2008	C1	EDL
5	Nam Ngum-5	100	430	2009	C1/N	EDL
6	Xeset-3	20	85	2010	S	EDL
7	Houay Lamphan	60	354	2010	S	EDL
8	Nam Ngum 4B	56	254	2011	N	EDL
9	Nam Beng	45	175	2012	N	EDL
10	Tha Kho	36	215	2013	C1	EDL
11	Nam Bak 2b	116	563	2012	S	EDL
12	Vieng Phoukha Thermal	50	263	2014	N	EDL
13	Nam Pot	23	97	2015	C1	EDL
14	Nam Sim	7	24	2015	N	EDL
15	Nam Kong 3	25	142	2016	C1	EDL
16	Nam Long	11	53	2016	C1	EDL
17	Nam Ngum 4A	55	250	2017	C1	EDL
18	Nam Sane2	62	279	2018	C1	EDL
19	Xexou	59	277	2019	S	EDL
	Total Plan	**991**	**4,493**			

Source: Electricite du Laos, 2003
Note: N: North, S: South, C1: Central-1, C2: Central-2

2. INFRASTRUCTURE DEVELOPMENT PLAN/STRATEGY IN LAO

The infrastructure development strategy of the country can be described from two angles: domestic policy and regional cooperation policy. The MCTPC has developed the sector strategy for 2020 as well as in each five-year plan based on the principle of turning the country into “land-linked”. In order to support the overall strategy of the country in this era of economic integration and cooperation within regions especially in the ASEAN, Greater Mekong Sub-region (GMS) and other sub-regional cooperation, the Government has developed several programs for infrastructure development as outlined in the succeeding sections.

2.1. Government Strategy for Infrastructure Development in Lao PDR

The government of Lao PDR continues with its efforts to develop the country's infrastructure, particularly the road sector, as per the overall plan described below.

Continue building the national roads which are sub-regional and serve as links between the north to the south, and from the east to the west, and complete the construction of paved roads in Vientiane Capital which link the municipal areas of provinces throughout the country. Roads from the municipal areas to districts in the provinces and focal development areas must be usable during both seasons.

- Give proper attention to maintenance and restoration of roads for them to last longer.
- Continue improving and upgrading road ways, water ways, and air ways to ensure the effectiveness of social, economic and security aspects of the country.
- Continue developing post and telecommunication and gradually expanding the services to all areas of the country as well as applying new technology in order to modernize the sector.
- Continue improving and restoring the cleanliness of all municipals as part of town planning and expanding water supply services that cover at least 59 percent of the total population in municipal areas in the next 5 years.
- Improve traffic safety management in order to reduce road accidents and other issues.
- Ensure an adequate supply and generation of electricity to meet domestic demand and to export the excess to other countries in the region. By the year

2010, try to provide the electricity for daily living of 70 percent of the entire households in the country, and of 90 percent by the year 2020.

Since improving the management and operational capacity of the sector is a priority in the achievement of the plan, capacity- building programs must therefore be provided to relevant staff to ensure the ability to supply quality services to all people in the country.

2.2. Regional Integration and Infrastructure Development Policy

2.2.1. Association of South East Asia Nations (ASEAN)

To achieve the dream where no mountains, rivers nor seas divide us and where every one is linked by friendship, cooperation and commerce, the development of infrastructure linkages among ASEAN countries becomes a very critical issue. The ASEAN especially attaches importance to such connectivity in the desire to concretize the concept of an ASEAN Economic Community (AEC). AEC's 11 priority sectors in the regional integration include air travel and tourism. Furthermore, maritime cooperation has been included as an area of cooperation toward establishing an ASEAN Security Community (ASC).

2.2.2. The GMS and Infrastructure Development Policy

Lao PDR has been an active participant in the GMS Program of Economic Cooperation since the program's inception in 1992. It has participated in ADB-assisted loan and RETA projects. The country was also the recipient of multi-country ADB loans

for the GMS such as, among others, the East-West Economic Corridor Project (EWEC).

Lao PDR has also been involved in 111 RETA projects, for which ADB has provided $59.6 million. These include, among others, the following priority sub-regional infrastructure activities:

(i) GMS Cross-Border Transport Agreement

(ii) Study on the Regional Indicative Master Plan on Power Interconnection in the GMS

(iii) Inter-Governmental Agreement on Regional Power Trade, Regional Power Trade Operating Agreement, and Regional Power Trade Coordination and Development

(iv) Development of the Energy Strategy, and

(v) Transport Sector Strategy Study.

2.2.3. Development Triangle Area (Cambodia – Laos – Viet Nam

The Development Triangle covers the territory of the following provinces: Mondulkiri, Rattanakiri and Stung Treng (Cambodia); Attapeu, Saravan and Sekong (Laos); and Dak lak, Daknong, Gia Lai and Kon Tum (Viet Nam). These provinces are located in the border areas of these three countries and share many similarities in terms of natural, economic and social conditions. The development level of the provinces in the Development Triangle is generally low compared to the average national level of their respective countries.

One of the main development and cooperation objectives for the Development Triangle in the border areas of Cambodia, Laos and Viet Nam is the coordination of the infrastructure development plans of the three countries, with the aim of supporting the requirements of the key economic activities in the Development Triangle.

3. ISSUES OF INFRASTRUCTURE IN LAO PDR

3.1. Infrastructure Development and Poverty Reduction

Infrastructure development, especially transportation and communication, has always been a priority sector of the country as it has direct and indirect relations to many issues. The Lao Expenditure and Consumption Survey (LECS 2) and participatory poverty assessments (PPA), for example, found a high correlation between the lack of road access and severe poverty. The very poor (17 per cent of the population) live in areas where infrastructure is particularly scarce. On average, the very poor may be found at least 15 kilometers from a main road. During the rainy season, 70 per cent among them have no road access[1].The National Growth and Poverty Eradication Strategy (NGPES) indicates that the continuation of transportation system improvement in Lao PDR is fundamental in supporting economic growth and realizing the goals and objectives outlined in the NGPES. While considerable progress has been made over the past decade in extending and upgrading the system, there are still many areas that are remote and isolated. The rural poor have identified this as one of the main causes of their poverty. Due to the difficulty in accessing markets to sell their surplus agricultural

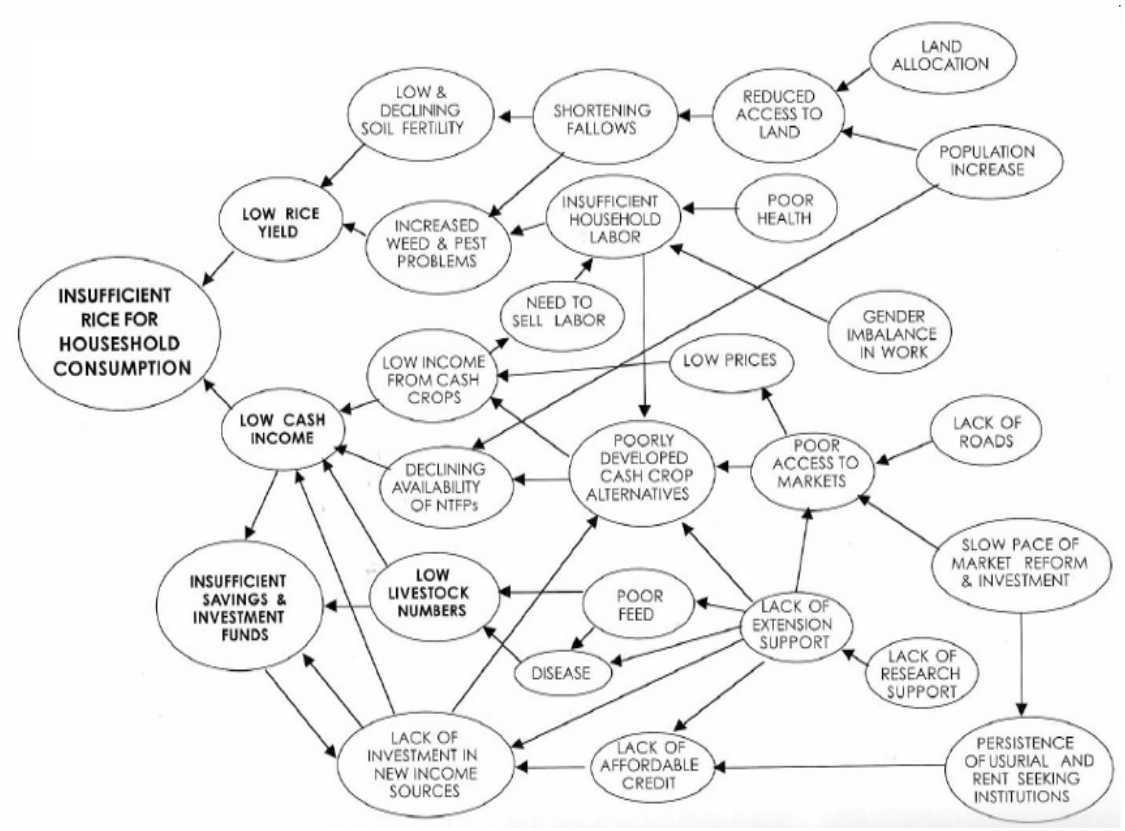
[1] National Growth and Poverty Eradication Strategy (NGPES), 2005

produce and other goods, the rural poor are locked into subsistence farming. Lack of access to all-weather roads or roads of any kind has also meant lack of access to schools, health facilities and other basic services such as electricity and potable water. Thus, poor infrastructure results in inter-generational poverty inasmuch as the poor people have limited opportunity and capacity to climb out of their poverty.

As such, road/transport sector has been identified as a second priority sector among 4 main priority sectors[2] for poverty reduction in the country. It is also a criterion to determine poverty especially at the village and district levels since constraint in terms of road access contributes to poverty vulnerability among villagers (see Diagram 1). Therefore, improving the road access for villagers has been considered as an important issue for poverty reduction of the country. Diagram 2 shows the poverty tree criteria in Lao PDR.

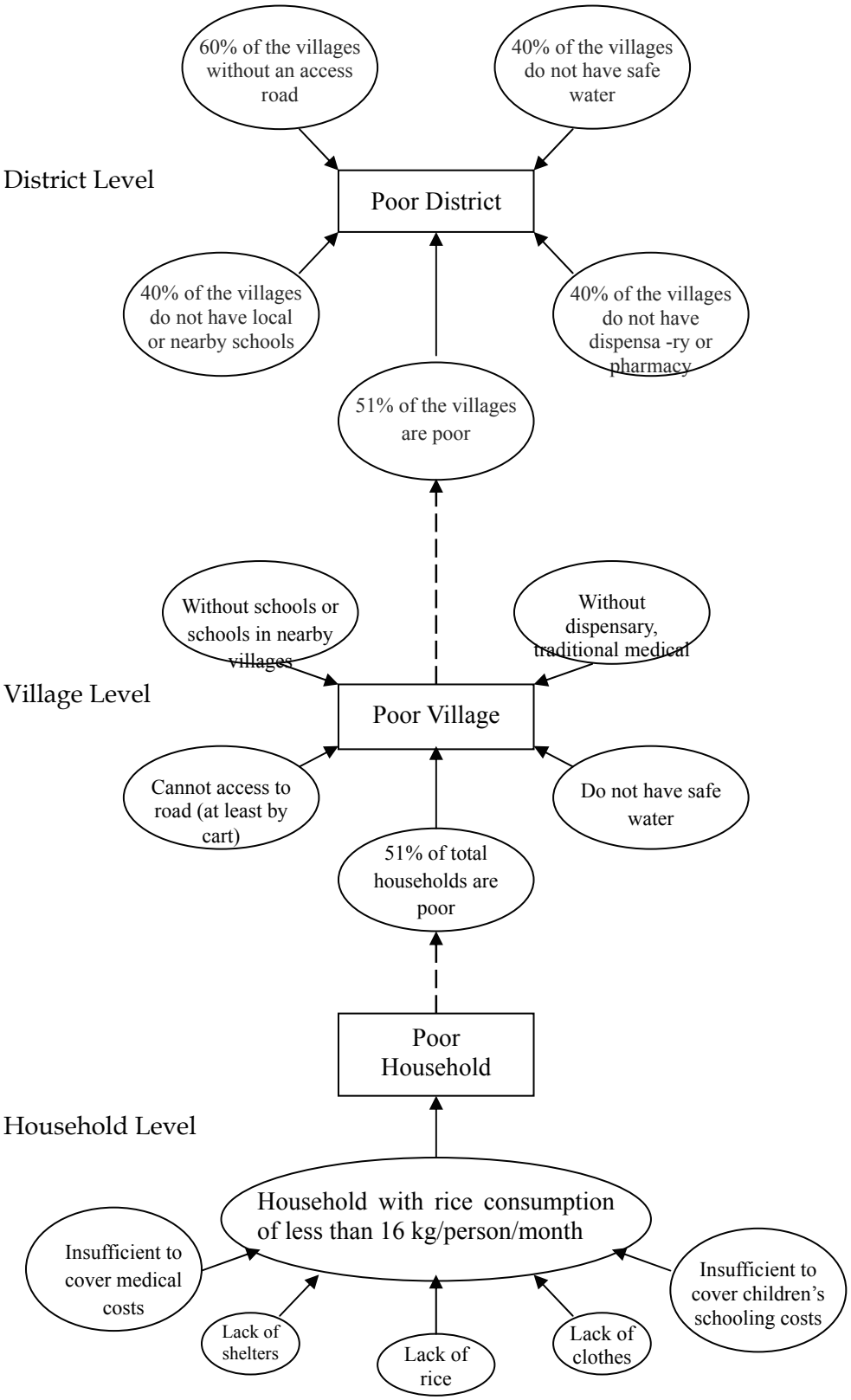
[2] The four main priority sectors for poverty reduction are: 1) agriculture sector; 2) road/transport sector; 3) education sector; and 4) health sector.

Diagram 1: Causal Diagram of the full set of relationships implicit in the people's poverty analysis



Source: Human Development Report, Lao PDR, UNDP, 2003

Diagram 1(Contd.): Causal Diagram of the full set of relationships implicit in the people's poverty analysis



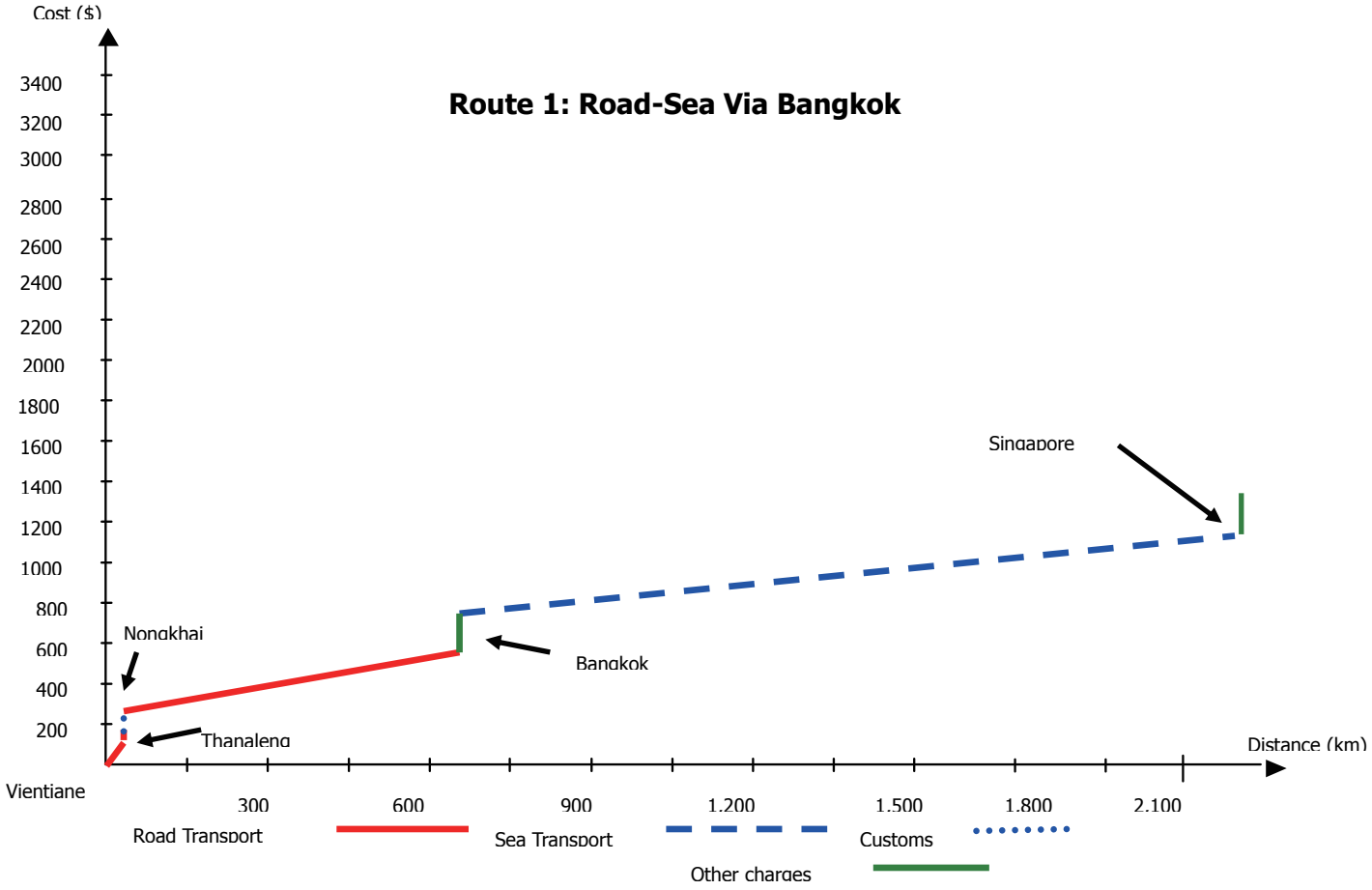
Source: Summarized from the NGPES, 2004

3.2. Infrastructure Development and Private Sector Development (Logistic Infrastructure)

One critical issue regarding infrastructure development for a land-locked country like Lao PDR is infrastructure logistic. As the country seeks to reduce poverty and graduate from the list of LDC countries in the world by 2020, the growth of its economy is seen as one of the means to attain this. The development of the private sector which mostly produces the goods for export is naturally a very important source of economic growth for this small domestic market. The situation of its being land-locked with poor infrastructure, including logistic infrastructure and other related concerns, has, however, reduced the price competitiveness of the country's exports.

At present, the most used mode of freight transportation for Lao exports to Singapore via Bangkok is a combination of the road and sea systems which provide the cheapest way and the least time consumed. This multiple mode of "Road-Sea" costs around USD 1,215/TEU with a competitive transit time of about 6 to 7 days. Road transport represents 30 percent of the total transport cost while sea transport has a ratio of around 19 percent. The total cost of transportation, including road and sea, accounts for about 49 percent of total cost in the whole process while other charges account for more than half of the total (Figure 11).

Figure 11: Most used of freight transportation of Lao exporters

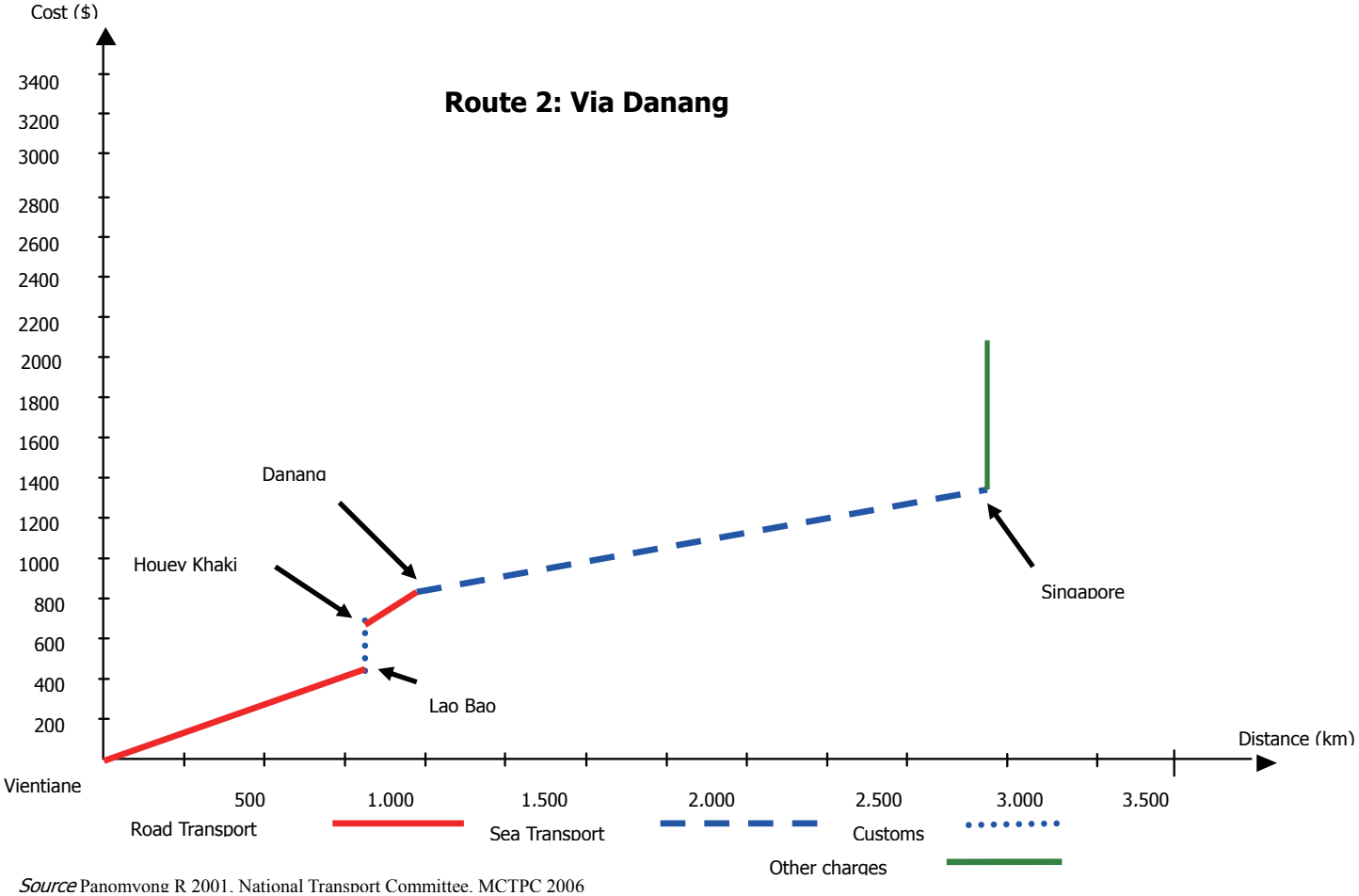


Source: Panomyong R 2001, National Transport Committee, MCTPC 2006

Other "Road-Sea" transport mode for Lao exports is via Danang in Viet Nam. However, according to information gathered, the total transport cost for this route covering a distance (between Vientiane and Danang) of 1,060 km amounts to about USD 2,150/TEU. This translates into a cost of USD 0.71/km. In comparison, the sea leg distance between Danang and Singapore is longer at 1,910 km long but costs only USD 0.21/km. The movement of freight itself is not considered to be the biggest difficulty in the Vientiane-Danang route, even with road transport comprising the bigger portion of the total transport cost (due to the distance from Vientiane to Lao Bao through Savannakhet before going to Danang) and with the sea transport mode representing only 18 percent

(Figure 12). What constitutes the main problem of this particular logistics channel is the 'other' charges not directly related to transport. These charges are very hard to quantify accurately because the amounts depend on the officials involved in the transit process who ask for these 'other' charges. This is one of the reasons why 'other' handling charges are very high for transit via Viet Nam at around USD 700 (Banomyong R, 2001).

Figure 12: Freight Transportation via Danang, Vietnam



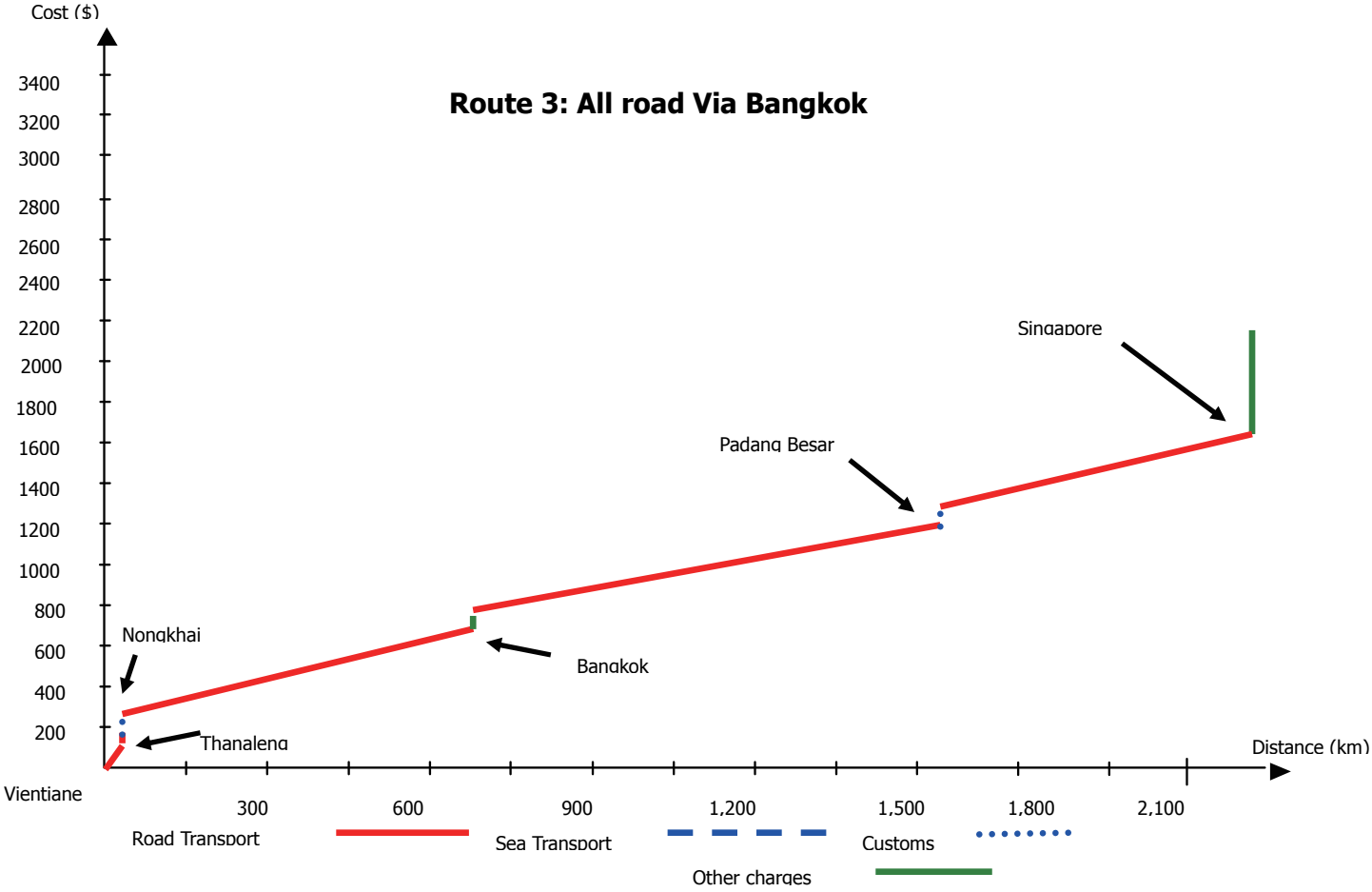
Source Panomyong R 2001, National Transport Committee, MCTPC 2006

According to Figure 12, other charges during the transportation account for about 46.5

percent of the total transport cost, with customs charges comprising up to almost 22 percent of the inland transport cost between Vientiane and Danang. The total time consumed is about 9 to 10 days, almost equally divided between the inland and sea legs. This transit time is based on the assumption that there are no administrative delays while the goods are in transit.

Another option for Lao exporters is the "All Road" route via Bangkok. This route presents the least time consumed when compared to other routes, with only 4 to 7 days of transit and with a total cost of about USD 2,139/TEU. However, this option has never been used because the truck that must transport the cargo for the whole journey must belong to the Express Transit Organisation (ETO), the Thai state-owned trucking company. It is the only company that has all the transit rights from Vientiane to Singapore via Malaysia. If a different trucking company would be involved, the goods will have to be transloaded in Nongkhai, Bangkok, and Padang Besar at an average cost of USD 12 per transload. This cost is included in the 'other' handling charges of USD 300 (Banomyong R, 2001).

Figure 13: Freight Transportation via Bangkok "all roads"



Source: Panomyong R 2001, National Transport Committee, MCTPC 2006

Figure 13 shows that road transport represents up to 73.5 percent of the total transport cost. Road transport cost is at USD 0.71/km per TEU from Vientiane to Singapore. A closer analysis of each segment will reveal that the road transport cost can be broken down as follows (Banomyong R, 2001):

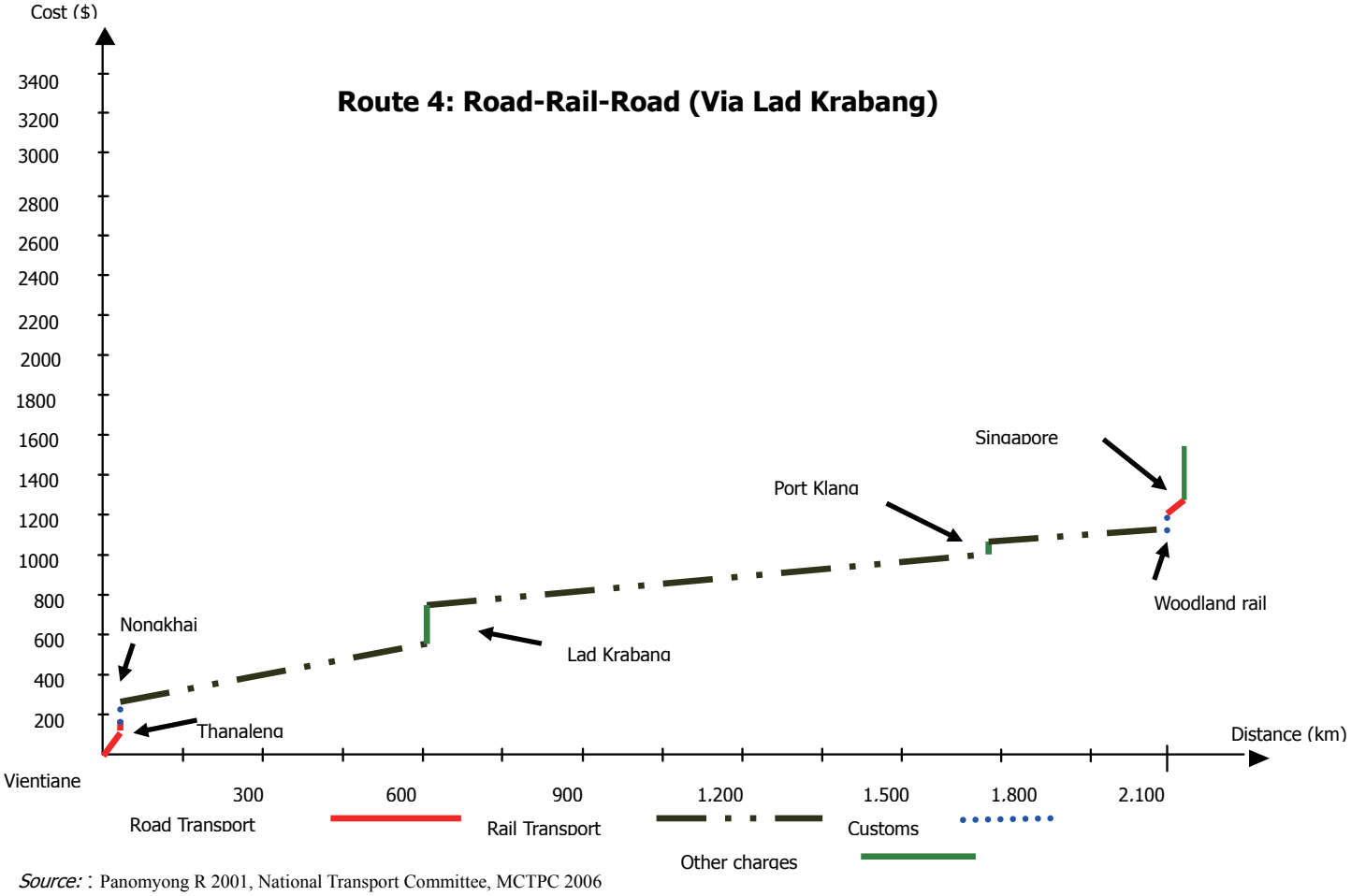
- Vientiane (Lao PDR) - Thanaleng (Lao PDR) leg is at USD 3.6/km per TEU;
- Thanaleng (Lao PDR) - Nongkhai (Thailand) leg is at USD 2/km per TEU;
- Nongkhai (Thailand) - Bangkok (Thailand) leg is at USD 0.49/km per TEU;
- Bangkok (Thailand) - Padang Besar (Malaysia) leg is at USD 0.67/km per TEU;

and

• Padang Besar (Malaysia)-Singapore leg is at USD 0.97/km per TEU.

Another cost- competitive route is the "Road-Rail-Road" from the Vientiane-Singapore corridor via Lad Krabang ICD at a cost of USD 1,550/TEU with a theoretical transit time of 8/9 days. In practice, however, the rail is never used (see Figure 14)because there is no regular schedule from Nongkhai to Lad Krabang ICD. The price for rail transport between Nongkhai and Lad Krabang Inland Clearance Depot (ICD), in the outskirt of Bangkok, is quite competitive at USD 350/TEU (Banomyong R, 2001).

Figure 14: Freight Transportation via Lad Krabang "Road-Rail-Road"



Source: : Panomyong R 2001, National Transport Committee, MCTPC 2006

Based on all the transportation routes and estimate costs and time given above, the "Road-Sea" route via Bangkok is the most competitive in terms of cost with reasonable time when compared to the other routes (refer to Table 3). However, this applies mostly to big exporters with huge volumes of goods. Majority of the Lao enterprises, meanwhile, are of small and medium sizes with small volumes of export goods. This is why said transportation costs are too high for them.

Table 3: Compare Transportation Cost and Time between Transportation Modes for Lao Exporters

Route	Total cost (USD)	Distance (km)	Transit time (Day)
Via Danang (Road-Sea)	2,150	2,800+	9 - 10 days
Via Bangkok (All road)	2,139	2,100+	4 - 5 days
Via LKB (Road/Rail/Road)	1,550	2,100+	7 - 8 days
Via Bangkok (Road-Sea)	1,215	2,100+	6 - 7 days

Source : Panomyong R 2001, National Transport Committee, MCTPC 2006

Although an alternative for Lao exporters is to use the "Road-Sea" via Danang since the use of the sea port in Danang may potentially be much easier for Lao PDR, if one compares the other costs involved, though, which include the condition and distance from Vientiane to Danang, the competitiveness of this route diminishes. In comparison to the Bangkok port, too, Danang port is not that competitive in terms of international standard and quality control.

On the whole, then, logistic transportation still remains as a constraint for Lao exports as well as for private sector development in the country.

4. CONCLUSIONS AND RECOMMENDATIONS

The situation of being land-locked with poor infrastructure has put a constraint for the socio-economic development of Lao PDR. To address this concern, the Government of Lao PDR has introduced a "land-linked" strategy that is parallel with regional and sub-regional infrastructure development trends, especially along the frameworks of, among others, the ASEAN, Greater Mekong Sub-region and Triangle Development Area. The strategy addresses the importance of infrastructure development, particularly road/transport sector, as the means to achieve the 2020 vision for the country to graduate from the list of less developed countries (LDCs) and to eradicate mass poverty by 2010. Infrastructure development has been identified as significant both for poverty reduction and private sector development. At the outset, attention should be given to the important issues relating to poverty reduction and 2) logistic infrastructure development to enhance private sector development. The following are the considerations and recommendations regarding these issues:

4.1. Infrastructure Development and Poverty Reduction

Focusing on rural infrastructure, particularly on roads, in order to ensure market accessibility for rural people is important to ensure income generation and poverty reduction. Previous studies show that improving market access, including quality of the access (good infrastructure), is crucial as a means for development of commercialization, ensuring of a stable income earning for the people and contributing to poverty reduction. Therefore, construction of rural roads (Farm-To-Market Road) to ensure market connection of the rural people should be prioritized. Top priority must be given to the

construction or maintenance of roads that connect rural production to markets, with special focus on border markets (as all provinces in Lao PDR share border with at least one neighbouring country), so that commercialization and improvement of the rural folks'produce as well as increase in their income earnings may be assured. This will correspondingly help improve their living standard and reduce poverty. The access road would provide opportunity for rural farmers to link to the growing demand for food products within the country and in the region.

4.2. Logistic Infrastructure Development and Private Sector Development

Considering the situation of current exporters, the most competitive transport route for their goods is by the road-sea mode via Bangkok through Singapore. Because the distance from Vientiane to Bangkok is the shortest and most convenient at present and since all industries are at present located in Vientiane, there is no other choice of a better route for exporters than this one.

Although there are other alternative routes for transportation, they are not that competitive. For example, the road-sea route via Danang is quite far from Vientiane as compared to Bangkok. Other modes, meanwhile, like the road-rail or all-rails route are not yet available (the railway is under construction). Taking this situation into account, the strategy should be to develop both the short-term and longer term development vision regarding the logistic infrastructure development. In this regard, among the recommendations are:

Short-term

Attention should be paid to current exporters of the country in order to enhance their business performance. Improving the following export and transportation procedures being practiced by them must be prioritized:

- Simplify procedures on freight transportation from Vientiane to Bangkok (Factory-To-Port Container Movement) since this route is the most economical and practical route for current exporters in terms of both cost and time.
    - Develop a consolidation service for small freight shipments in the Vientiane-Bangkok corridor.
    - Based on the Lao-Thai Agreement, negotiate with Thai authorities, including customs clearance, on the reduction of the number of signatures, and reduce regulations on import-export, among others.
    - Establish an Inland Container Depot (ICD)/Dry Port near the border where the shipping lines could deliver loaded containers and receive cargo for loading into empty containers. The ICD could also provide a focal point for transactions with both the shipping lines and the trucking companies. It would allow importers to return empty containers to the ICD rather than to Bangkok. Similarly, it would act as a dispatch point for empty containers to be loaded with exports thus reducing the transport of empty containers to Bangkok. This facility would also allow repositioning empties to shippers within Thailand as well as to container

yards around Bangkok using a single trailer or rail wagon for two 20' containers.[3]

- License customs clearance agents. This would include certification of technical knowledge combined with a commitment to remain current on customs procedures. It would also include a requirement for bonding individual customs agents.

- Provide capacity building programs for logistics industry through cooperation with international organizations and neighboring countries, including programs of TIFFA or from UNCTAD or the Bank's Distance Learning Program, in order to improve their logistic services of domestic forwarding companies.
- Monitor clearance times and productivity at the border crossings in order to ensure the smooth movement of transportation.

Long-term

For the medium and longer terms, attention should be paid to providing diversification of choices for the business community. Not only present exporters but potential and aspiring exporters should be identified. The following are the recommendations for the long- term strategy regarding logistic infrastructure development of the country.

- Develop other modes of transportation such as the road-rail-road, all-rails or rail-road mode which is the cheaper. However, this might require huge related

[3] Thai customs has identified an area for constructing an ICD in Nongkhai. This should be considered in the marketing study which would be prepared leading up to the establishment of a Lao ICD. (based on DTIS, 2006)

infrastructure investments. Hence, this is where regional development programs such as those within the ASEAN and GMS regions would come in.

- Industrial decentralization is also significant. Because most industries are centralized mainly in Vientiane today, it leads to less choice when dealing with transportation in the country. Therefore, decentralizing industry to other parts of the country would widen choices for transportation, e.g., development of Savannakhet as the new industrial area of the country will provide another route of transportation like the road-sea channel via Danang, which is a shorter distance when compared to Bangkok.
- Finally, because the transportation mode of "road-sea" via Danang in Viet Nam might be a better option for transportation due to shorter distance, cooperation and negotiation with concerned authorities in Viet Nam for the reduction of other costs related to transportation as well as for the upgrade of the Danang port (improve capacity and quality, among others) would be necessary.

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Chapter 7: Infrastructure Development in Malaysia

G. Naidu

Abstract

At independence Malaysia inherited a reasonably well-developed set of infrastructure facilities. The Government built on the initial stock of infrastructure and all categories of infrastructure have since expanded manifold and facilities have also been modernised. By and large the Malaysian Government has succeeded in meeting the growing demand for infrastructure. The Government has also made considerable progress in making infrastructure available in the less developed parts of the country. The development of infrastructure has required very large investments. The infrastructure sector has received the largest share of public sector development expenditure in every one of the Malaysia Plans. However from the early 1990s because of resource constraints faced by the public sector, among other reasons, the Government has encouraged and facilitated private sector participation in infrastructure development. In the more recent period the private sector has been investing more in infrastructure than the public sector. Inspite of the success achieved in the development of infrastructure there are many areas where policy formulation and implementation can be improved. The formulation of medium-term plans for all segments of the infrastructure sector is one area where the Government needs to act. Such plans will help avoid ad hoc project selection. There should also be a clearer specification of the areas for private sector participation in infrastructure development and all privatisation exercises should be through an open tender bidding process. Also more rigorous project evaluation is necessary to avoid

costly project failures. Other areas for improvement include better monitoring of performance of service providers. A new policy also needs to be formulated to promote public transport in urban areas. Finally, the development of infrastructure in the less developed parts of the country should be accorded higher priority.

1. INTRODUCTION

This report contains a summary of the main findings on infrastructure development in Malaysia. It also provides a set of recommendations on how infrastructure planning and development in Malaysia can be improved.

2. SUMMARY OF FINDINGS

This section summarises the important aspects of the development of infrastructure in Malaysia. The discussion covers the period 1966-2005 which coincides with the three decades from the First Malaysia Plan (1966-70) to the Eighth Malaysia Plan (2001-2005).

2.1. Background

Three aspects to the Malaysian economy continue to have an important influence on infrastructure development in the country, these being the growth performance of the economy, the physical make-up of the country and the socio-economic disparities between the different parts of the country. These three matters have had to be taken into

consideration in the formulation of infrastructure policies and allocation of resources for infrastructure development.

2.1.1. Growth performance

Since independence the Malaysian economy has been growing at a fairly rapid pace. In most years the growth rate has ranged between 5-9 per cent a year. As a result per capita income in the country in 2005 had risen to RM18, 040 from RM960 in 1966. The present average income in Malaysia, equal to about USD5154, places it in the category of middle-income countries of the world. The structure of the economy has also changed from being heavily dependent on the primary sectors, of agriculture and mining, to one in which manufacturing and services are the main contributors to national output, employment and export earnings. An important feature of the Malaysian economy is its heavy dependence on external trade. The country's economic well-being is to a large extent tied to the performance of its exports in international markets.

Massive investments for the development and modernisation of infrastructure facilities were clearly required not only to cope with the demands of a rapidly expanding economy but also to ensure that the country's competitiveness in global markets was not compromised for lack of good quality infrastructure.

2.1.2. Physical components

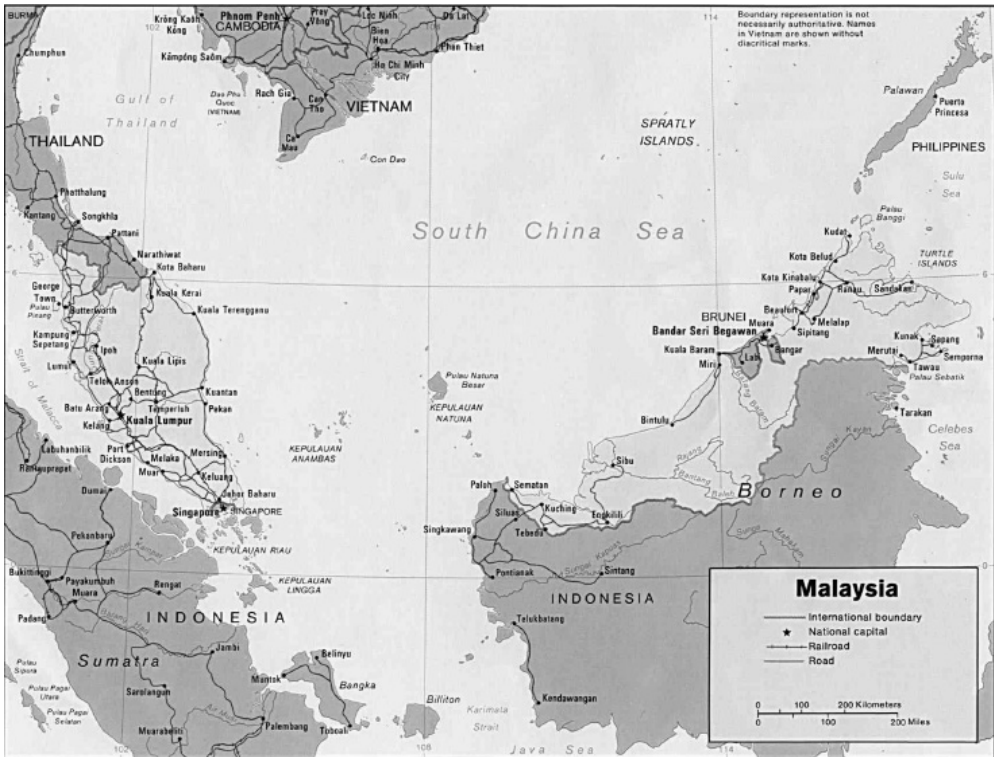
Malaysia consists of two physical components, these being Peninsular Malaysia and Sabah/Sarawak. The latter two states are on the island of Borneo. (Figure 1) Because

there is no contiguity between Peninsular Malaysia and the two states of Sabah and Sarawak, from the perspective of infrastructure planning Malaysia does not constitute a single entity. Each component part thus has to be treated as a separate physical entity, which complicates transport planning and development.

2.1.3. Socio-economic disparities

There are wide disparities between the levels of development of the different parts of the country. The west coast of Peninsular Malaysia has been and remains much more developed than the other parts of the country. The west coast states of Peninsular Malaysia are also more densely populated than the east coast states and Sabah and Sarawak.

Figure 1: The Map of Malaysia



The socio-economic differences have had to be considered by the Government in formulating its infrastructure development policy

2.2. Objectives in infrastructure development

Two motives have shaped the scale and pattern of the infrastructure development strategies of the Malaysian Government. The first is the recognition that infrastructure is vital for the economic development of the country. In this regard the objective of the Malaysian Government is to expand infrastructure facilities to keep abreast of the growing demand for infrastructure arising from the growth and transformation of the economy. The avoidance of infrastructure shortages is thus a paramount aim of the Government. Meeting the growing demand for infrastructure from the modern sectors of the economy, including the external sector, is not the only objective driving the Malaysian Government's infrastructure policy. A second aim is to develop infrastructure to serve socio-economic ends. Here the focus is on providing infrastructure to promote the development of the less developed regions of the country, including rural areas. Improving the accessibility of these regions to markets is intended to bring about a more balanced development of the country and redress economic disparities.

2.3. Investment in infrastructure facilities

At independence Malaysia had a reasonably good set of infrastructure facilities. The distribution of facilities, however, was uneven with some parts of the country better endowed than others. The Malaysian Government built on the initial stock of

infrastructure, expanding and modernising infrastructure facilities and at the same time addressing the infrastructure inadequacies of the less developed regions of the country.

Because of the importance of infrastructure for economic development and for alleviating poverty, the Government of Malaysia continues to give the highest priority to infrastructure development. This is evident from the following:

(i) Infrastructure has received the largest share of public sector development expenditure in the Malaysia Plans. The amount of resources earmarked for infrastructure development has generally increased from one Malaysia Plan to the next and often by very significant amounts. By way of illustration, in the First Malaysia Plan (1966-70) the amount spent on infrastructure was RM1,387.9 million. In the eighth Malaysia Plan the corresponding amount was forty-six times higher at RM RM64,128.2 million

(ii) Total investment by the Malaysian Government on infrastructure development over the last thirty years (1966-2005) was RM209,696 million, which at the current exchange rate is equal to USD63,627 million.

(iii) From the early 1990s public sector investment in infrastructure has been supplemented by investment from the private sector. The Government's privatisation policy has facilitated private participation in infrastructure development and management. Under the policy there has been divestiture in the equity of state-owned enterprises such as Klang Port, Telecom Malaysia and the electricity utility company,

Tenaga Nasional. Greenfield projects under various types of contractual arrangements between the Government and private sector have also been sanctioned. (The North-South Expressway and Tanjung Pelepas Port are examples of numerous BOT projects in the infrastructure sector). Over the period of the last few Malaysia Plans, the private sector, including Government-linked companies, have been investing more in infrastructure than the Government.

(iv) As a proportion of GDP investment in infrastructure has been very high, ranging between a low of 1.9 per cent in the Second Malaysia Plan and a high ratio of 9.4 in the Seventh Malaysia Plan.

(v) Transport has been the biggest recipient of investment in infrastructure. Within the transport sector most of the investment has gone into the construction of roads. Other infrastructure segments have also received sizeable investments in capacity expansion and modernisation. More recently the electricity and telecommunications industries have seen massive increases in investments.

(vi) While most of the investment in infrastructure has gone into meeting the demand for infrastructure from the modern economic sectors of the economy, mostly located in the west coast states of Peninsular Malaysia, growing amounts are also being invested in the less developed parts of the country to achieve socio-economic objectives of poverty eradication and balanced regional development. The rural roads programme and the pursuit of universal service provision in the supply of electricity and

telecommunications services are examples of developing infrastructure in the rural areas and less developed regions of the country.

2.4. Growth of infrastructure stock and capacities

The resources invested in physical infrastructure in Malaysia have contributed to the growth and modernisation of various categories of infrastructure in the country. (Table 1) The following illustrate the rapid expansion of infrastructure facilities in the country.

2.4.1. Roads

In 1966 the network of roads in Malaysia was 15 thousand km. By 2005 the total length of roads in the country had increased almost six-fold to over 85 thousand km. The main inter-city roads in Peninsular Malaysia are now mostly two or multiple- lane dual carriageways. The 869 km North-South Expressway from Johor Baru in the south of Peninsular Malaysia to Padang Besar on the Thai border in the north is a multi lane dual carriageway road and is an example of the huge improvements to the road network of the country. Many of the inter-city highways and also urban roads have been developed by the private sector as BOT projects and are toll roads.

2.4.2. Rail

Rail transport is a very minor mode of transport in Malaysia. With the size of the inter-city rail network only about two per cent of the road system the small share of rail

in the transport of freight and passengers is not unexpected. However, the role of rail in the country's transport system is set to grow. In the latest Malaysia Plans the Government has indicated its intention to develop rail transport to play a larger role in both inter-city and urban transport. The main inter-city rail line of KTMB, from Johor Baru in the south to Padang Besar on the Thai border in the north, is now being double-tracked and electrified. The urban rail system in Kuala Lumpur is in the process of being expanded and new urban railways will be constructed in other towns in the country.

2.4.3. Ports

Because of the development of new ports (such as Port of Tanjung Pelepas and West Port) and the construction of additional berths at existing terminals, the ports sector of the country has undergone a massive expansion in capacity. The terminals have also been modernised to handle new cargo types and bigger vessels. The expansion of port facilities is evident from the fact that total cargo handling capacity of Malaysian ports rose from 25.5 million tonnes in 1980 to 443.3 million tonnes in 2005. In the past two decades the development of the ports sector has been largely financed by the private sector.

Table 1: Malaysia infrastructure growth, 1965-2005

Infrastructure Sub-Sector	1965	2005
Roads		
Total Length of Roads (km)	15,256	87,025
Paved	12,464	67,851
Gravel	2,107	15,989
Earth	785	3,185
Distribution of Roads (%)		
Peninsular Malaysia	79.8	68.6
Sabah	12.1	18.8
Sarawak	8.1	12.6
Railways		
Length of Railway Tracks (km)		
KTMB	1,600	1,667
Sabah Railways	131	131
Urban Railways	-	121.6
Ports		
Number of Major Ports	2	8
Number of Dry Cargo Berths	19	233
Telecommunications		
Number of Telephone Subscribers	107,000	4,400,000
Telephones per 100 population	1	16.6
Electricity		
Electricity Generation Capacity (MW)	336	19,217

2.4.4. Telecommunications

The physical expansion of the telecommunications sector has been very rapid. The penetration rate of fixed lines went up from 1 per cent of population to 16.6 per cent between 1966 and 2005. Cellular phone penetration rate went up from 21.8 per cent in 2000 to 74.1 per cent in 2005. Internet subscriptions have also risen sharply. Internet dial-up subscriptions went up from 1.7 million in year 2000 to 3.7 million in 2005. In the case of broadband in 2005 there were about 0.5 million subscribers. In the more recent period, the development of basic telecommunications and the introduction of new products have been largely financed by the private sector.

2.4.5. Electricity

In the electricity industry too there has been substantial expansion. Generation capacity increased from 336 MW in 1966 to 19 thousand MW in 2005. Private sector IPPs are now the main sources of the increase in generation capacity. Transmission and distribution capacities have also risen substantially. An important indicator of the growth of the electricity is the big increase in the rural electrification coverage in Peninsular Malaysia as well as in Sabah and Sarawak. This is part of the Government's policy to extend infrastructure to the rural areas of the country.

2.5. Infrastructure expansion plans

The current horizon for the development of infrastructure in Malaysia is the Ninth Malaysia Plan period of 2006-2010. There are no development plans for infrastructure

beyond 2010. During the Ninth Malaysia Plan public sector investment in infrastructure is projected to be RM41.6 billion, an increase of about 15 per cent over the RM36.2 billion invested during the Eighth Malaysia Plan. Private sector resources will supplement public sector investment in infrastructure. How much the private sector will invest in infrastructure during the Ninth Plan period up to 2010 cannot be ascertained but going by past experience the amount of private sector investment in infrastructure will almost certainly exceed the RM41.6 billion to be spent by the Government.

Even though the total investment in infrastructure up to 2010, inclusive of investment by the private sector, is not known, indications are that capacity expansion and sector modernisation will continue unabated. There will also be some important changes in priorities. The following highlight the expected growth and development of infrastructure up to 2010.

2.5.1. Roads

Roads are the primary mode of domestic transport, accounting for well over nine-tenths of all passenger and freight traffic in the country. Although no details are available on the road expansion plans of the Government up to 2010 the road network will, as during other Plans, grow substantially in the course of the Ninth Malaysia Plan. The inter-urban roads in the more developed parts of the country would, wherever it is deemed financially feasible, be developed by the private sector. The Government in turn will concentrate on the development of rural roads and construct roads to link the less developed parts of the country to the main network of inter urban highways.

2.5.2. Rail

After a long period of limited investment in KTMB, the inter-city railway operator in Peninsular Malaysia, its infrastructure is now being expanded and modernised. Specifically, a programme to double-track and electrify the entire west coast line of KTMB is underway. Upon completion KTMB will be in a much better position to compete for passenger and freight traffic along the most important transport corridor in the country. Similarly, the improvements underway to the small Sabah Railways will allow it to play a bigger role in its hinterland. The introduction of rail systems in the capital city of Kuala Lumpur in the 1990s and the planned expansion of the network as well as new systems in other urban conurbations in the country suggest an important shift in the Government's urban transport policy. In an area long dominated by road transport, there are now clear indications that rail will play a more important role in the development of public transport facilities in the larger cities in the country.

2.5.3. Ports

No new ports are being planned in the country under the Ninth Plan. The focus will be on the expansion and modernisation of existing ports, especially those catering to the country's foreign trade and mainline operators. There will be substantial investment in the expansion of terminals, most of which will be financed by the private sector. The cargo handling capacity of Malaysian ports is expected to increase from 443.3 million tonnes in 2005 to 570.0 million tonnes at the end of the Ninth Malaysia Plan in 2010. This is a 28.6 per cent increase within a five-year period. The importance of the external

sector to the economy is clearly reflected in the projected growth of the ports sector.

2.5.4. Telecommunications

The growth in the telecommunications sector will be in the cellular and internet segments. Cellular subscriptions are expected to increase from 19.5 million to 24.4 million between 2005 and 2010, raising the penetration rate of cellular phones in the country from 74.1 per cent to 85.0 per cent. Subscriptions to the internet are expected to increase rapidly. Dial-up subscriptions are projected to increase from 3.7 million in 2005 to 10.0 million in 2010, the penetration rate thus going up from 13.9 per cent to 35.0 per cent. Internet broadband subscriptions are forecasted to increase seven-fold within five years from 0.5 million subscriptions in 2005 to 3.7 million subscriptions in 2010.

2.5.5. Electricity

Electricity generation capacity of the country is projected to increase by 31.4 per cent from 19,217 MW in 2005 to 25,258 MW in 2010. Substantial improvements are also expected in rural electrification coverage. Nation-wide the rural electrification coverage, already high at 92.9 per cent, is forecasted to increase to 95.1 per cent. Sabah and Sarawak, which have the lowest rural electrification coverage rates, will see significant improvements. In the case of Sabah the percentage will increase from 72.8 per cent in 2005 to 80.6 per cent in 2010. In Sarawak rural coverage is planned to improve from 80.8 per cent to 89.6 per cent between 2005 and 2010.

2.5.6. Water sector

Water supply is already quite well developed in Malaysia. Water supply coverage is projected to further increase from 95.0 per cent in 2005 to 96.8 per cent in 2010. The rural areas will see big improvement in water supply coverage, from 92.0 per cent in 2005 to 95.2 per cent in 2010.

3. POLICY RECOMMENDATIONS

By and large the Malaysian Government has been quite successful in the development of infrastructure in the country. The better-developed parts of the country have seen their infrastructure facilities expanded and upgraded continuously and they have seldom had to contend with infrastructure shortages. Economic development of the country has not been impaired for lack of infrastructure. The country's external sector too has benefited from the availability of modern infrastructure facilities. Also in the context of the physical make-up of the country and the inequalities between its different components, the Government has also made considerable progress in extending infrastructure to the poorer sections of society and the less developed parts of the country.

Notwithstanding the successes in the development and modernisation of infrastructure, there are a number of shortcomings in the Government's infrastructure development policy and in its implementation. The following highlight the areas of concern and suggest how the shortcoming in the Malaysia Government's infrastructure policy could be rectified.

3.1. Planning for infrastructure development

The Economic Planning Unit (EPU) of the Prime Minister's Department is the central agency largely responsible for infrastructure planning. The National Implementation Task Force chaired by the Prime Minister oversees implementation of projects. In the five-year planning cycle of the Malaysia Plans, the EPU finalises infrastructure projects for inclusion in the Malaysia Plans. The projects are identified by the line ministries and prioritised by them in accordance with availability of resources and allocation of resources ascertained by the EPU. The selection of projects, however, is not done within the context of long-term sector plans. On the contrary, except for the roads sector, which has a master plan for road development, other infrastructure ministries do not have long-term or even medium-term sector plans. For this reason there is a danger that project selection is ad hoc in nature. Projects are also not subjected to rigorous evaluation. Under the conditions that obtain now it is difficult to achieve integrated infrastructure planning.

To ensure optimum and efficient utilisation of resources, the EPU should require line ministries responsible for infrastructure to develop medium-term plans of ten-year duration. Clearly these should be continuously updated to remain relevant. And the EPU should scrutinise not only the medium-term plans of the relevant ministries for consistency and integration with other infrastructure sectors, it should also evaluate all infrastructure projects proposed by the ministries in the context of the medium-term plan of the ministry concerned.

3.2. Role of public and private sectors in infrastructure

Whilst private sector participation has contributed much to the development of infrastructure in the country, the areas for private sector involvement are not clearly indicated in the Malaysia Plans or elsewhere. A clearer demarcation of the areas for public sector involvement and those segments that should be available for private participation will facilitate the development of infrastructure in a comprehensive and transparent fashion, allowing the public sector to concentrate on infrastructure facilities it is best able to develop and the private sector to build those facilities it can undertake.

Within the infrastructure plans of the ministries, the EPU, in consultation with the ministries, should classify the projects for public sector development and those for the private sector to undertake. This would also prevent dubious infrastructure project proposals by the private sector.

3.3. Improvement of efficiency

Many privatised suppliers of infrastructure services enjoy considerable market power. Ports and the privatised utility companies – Tenaga Nasional and Telekom Malaysia - are examples of service providers who possess significant monopoly power. In such cases mechanisms have to be put in place so that their considerable market power is not used to exploit consumers or to conceal operational inefficiencies.

To improve the efficiency of the suppliers of infrastructure service the Government

should create regulatory mechanisms or authorities to, among others, monitor the performance of the operators. These agencies should and also be vested with the power to impose penalties for failure to meet performance standards. The performance standards should be in the form of Key Performance Indicators (KPIs). As of now such mechanisms have not been put in place in many segments of the infrastructure sector.

3.4. Evaluation of project proposals

Infrastructure projects proposed by Government agencies and also those proposed by the private sector have often not been subjected to rigorous scrutiny and evaluation. The result has been project failures and stranded facilities. There are numerous examples to illustrate this point. First, there is the case of the branch line of KTMB to PTP whose utilisation is exceedingly low (currently about 3 trains per week compared to the projected 10 trains a day). Likewise, some BOT road projects (like the Seremban – Port Dickson Highway) were rendered financially unsustainable and were rescued by the Government. Even more glaring has been the failure of all three urban rail transit systems in KL – the STAR and PURTA lines and the KL Monorail system – that also had to be taken over by the Government and are now owned by Prasarana (the Government-owned infrastructure company) and operated by Rapid KL, a subsidiary of Prasarana. One lesson to be learnt from the failures of the private sector initiated projects and their subsequent rescue by the Government is that because the allocation of risk is highly inequitable, there is a tendency towards undertaking adventurous projects of dubious viability. The willingness of the Government to take over failed projects and compensate the private sector parties fully also raises issues of moral hazard.

Infrastructure projects, most of which are large and long lasting, must be subjected to rigorous appraisal and evaluation. This is a responsibility ultimately of the EPU

3.5. Terms and conditions of private participation in infrastructure.

The growth and modernisation of infrastructure in the country would not have occurred without the participation of the private sector. However, private participation in infrastructure has not been an unmitigated success. There are a number of issues here. First, the Government allows the private sector to initiate projects and submit unsolicited proposals. The Government also approves projects through direct negotiations with private sector parties. Private sector participation in infrastructure in Malaysia has seldom been through a tender exercise from which the best candidate to develop and manage the infrastructure facility is selected. Second, there is no assurance in the contracting process that project development costs are minimised. For these reasons the efficacy of many privatised projects has been compromised. One consequence is that user fees on infrastructure have often been higher than they need have been. Development costs also would have been lower had the awards been made via a tender exercise. Many privatised road projects in Malaysia have been criticised on account of this and the Government has been accused of ignoring user interests in the award of contracts. Similar criticisms have been levelled at the IPP licences where the Power Purchase Agreements (PPAs) have included “take or pay” clauses and purchase prices were much higher than if the IPPs were awarded on a tender bid basis. The manner in which the private sector is inducted into the infrastructure sector also allows

for political favouritism and “cronyism”.

Unless infrastructure projects to the private sector – be it sale of equity of SOEs or development of greenfield projects – are awarded through a transparent open tender process there is always a high probability of large scale efficiency losses.

3.6. Infrastructure for socio-economic development

The more developed parts of the country, the west coast of Peninsular Malaysia being the prime example, have been the biggest beneficiaries of infrastructure development. It is also true that the less developed parts of the country have not been ignored. In fact considerable progress has been made in the development of infrastructure for the less developed regions of the country. But many shortcomings still prevail in the supply of infrastructure for the poorer parts of the country. The supply of electricity to rural households, for example, ought to be much higher than it is now, even though considerable progress has been made. Another area of concern is water supply. Although the coverage on the whole is quite high, there are still many households without potable water supply. Likewise, sewerage service coverage should be much higher that it is now. Roads are another category of infrastructure that could be better developed in the less developed parts of the country. For one thing, too high a percentage of roads in the rural areas are unpaved and are instead gravel and earth roads. A more serious failure is the absence of a good inter-urban network of roads in both Sabah and Sarawak. The major road networks in both the states are still two-lane single carriageways and therefore of limited capacities.

With the private sector willing to finance those infrastructure facilities that are able to pay their way, such as urban roads and ports, the Government should concentrate its resources and make a concerted effort on developing the infrastructure for the less developed regions of the country.

3.7. Role of rail and public transport

Rail is now a very small player in the transport markets of the country. Concerns about the environment, fuel efficiency and safety have, however, have combined to create new opportunities for rail transport in both the inter-city transport markets and in urban areas. The small size of the country and the fact that most traffic markets are unlikely to generate large traffic flows mean that rail may not be financially viable in many of the country's transport markets. But while rail operations may not be financially sustainable it does not obviate the case for rail. What is required is that competition between rail and road transport is on a level playing field. This situation does not now obtain in the country. The appropriate policy response is to ensure that road users are made to pay the full social cost of road transport, including the cost of all negative externalities. This will improve the prospects for rail transport. In the event, and for whatever reason, it is not possible to charge road users full social cost then a subsidy for rail operations is justified.

Subsidies for rail transport, if economically justified, should be provided. Subsidies should, however, be made available in a transparent manner and properly targeted and

its administration should not undermine firm level efficiency. In the urban transport markets, rail should be integrated with other modes of public transport.

3.8. Urban infrastructure development policy.

Cities in Malaysia experience serious levels of congestion and high levels of pollution from the emissions of road vehicles. Government policy has been slow to respond to these challenges. The Government has continued to cater for the growing volume of journeys by private vehicles by building new roads, expanding existing ones and constructing ring roads. This policy of continuously accommodating ever-increasing volumes of traffic is no longer tenable and a new urban transport policy is imperative. This policy must recognise the limited space for road infrastructure in urban areas. In any event the private car should be made to adjust to the city and not vice versa.

The Government needs to focus on the development of public transport infrastructure and services. Also land use decisions in cities should take into account the implications on the transport sector. Finally, road users must be required to pay the full marginal social cost of travel on urban roads through a system of congestion prices. If the latter option is not possible or feasible, then properly tailored subsidies to public transport are justified.

3.9. Reduce wastages and excess capacity

In some infrastructure segments there is a great deal of wastage. An example is in the water sector where the level of non-revenue water is very high. Old and leaking pipes

are one reason whilst water theft is another explanation. In the electricity sector the problem is an uneconomically high level of reserve margin. There is also theft in the electricity industry. In both these examples the losses are serious. Some roads, including some privatised ones, too have turned out to be in excess of needs. Part of the explanation for the excess capacity and wastage is poor planning on the part of the Government and also lack of enforcement.

Better planning and modern technology can reduce the resource wastage. Also more stringent enforcement can help minimise losses from theft of water and electricity.

3.10. User fees for infrastructure

Currently the Government regulates user fees for many infrastructure services. Even where there are contractual arrangements for upward revision of user fees, such as in the case of toll roads, the Government has often stopped the operators from raising toll rates on the due dates, compensating them for the delay in the revision of toll rates. In the electricity sector there are "pass through" provisions but the Government has often compelled Tenaga Nasional, a Government-linked company, to delay the imposition of higher tariffs. The reasons for the control of user fees are both political and economic. In the latter case the impact of high user fees on price levels remains a concern of the Government. However, the failure to allow prices to be adjusted to take into account increases in input costs can in the long run force service providers to cut back on maintenance and delay expansion and modernisation of facilities. At the extreme, their entire operations may be rendered unsustainable.

The Government needs to formulate a rational policy on the issue of prices for the use of infrastructure services. A mechanism needs to be put in place to assess, in a scientific manner, all requests from service providers for tariff increases. The mechanism should also allow for the views of consumer groups to be heard. The policy should encompass all infrastructure sectors, from the transport industries to the utilities.

Chapter 8: Infrastructure Development in Singapore

Hank Lim

Abstract

Just 40 years ago, Singapore faced the problems of overcrowding in the city, poor living conditions and a severe lack of infrastructure. Today, Singapore is a thriving city and international business hub characterized by a high standard of living in a clean and green environment but the success did not come about by chance but through a process of proactive and farsighted planning. From the experience of Singapore, infrastructure is clearly central to socio-economic advancement. An efficient infrastructure facilitates delivery of information, goods and services, supports economic growth and assists in achieving social objectives such as raising the living standards and educational levels. Through a broadly chronological study of various aspects of Singapore's infrastructural development, and the challenges faced, the paper hopes to highlight developmental strategies that could be transferred to other developing Southeast Asian countries. Singapore's Infrastructural Development has been often guided and driven by government agencies set up for that purpose.

1. INTRODUCTION

Just 40 years ago, Singapore faced the problems of overcrowding in the city, poor living conditions and a severe lack of infrastructure. Today, Singapore is a thriving city and international business hub characterized by a high standard of living in a clean and green environment but the success did not come about by chance but through a process of proactive and farsighted planning.[1] From the experience of Singapore, infrastructure is clearly central to socio-economic advancement. An efficient infrastructure facilitates delivery of information, goods and services, supports economic growth and assists in achieving social objectives such as raising the living standards and educational levels.

Through a broadly chronological study of various aspects of Singapore's infrastructural development, and the challenges faced, the paper hopes to highlight developmental strategies that could be transferred to other developing Southeast Asian countries. Singapore's Infrastructural Development has been often guided and driven by government agencies set up for that purpose. The Singapore government's Concept Plan was first developed in 1971 and then fine-tuned. A "Ring Concept" was chosen: high density satellite towns linked to the Central Business District by expressways and a rail system and this was followed by slum clearance and an extensive public housing project.[2]

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[1] Urban Redevelopment Authority, "Our History" in the URA website [downloaded on 1 Dec 2007], available at http://www.ura.gov.sg/about/ura-history.htm

[2] Urban Redevelopment Authority, "Our History" in the URA website [downloaded on 1 Dec 2007], available at http://www.ura.gov.sg/about/ura-history.htm

2. HOME OWNERSHIP

Two of the most pressing national concerns following independence were unemployment and lack of public housing and two government agencies were tasked with solving these problems - the Housing and Development Board (HDB) and the Economic Development Board (EDB).[3] The HDB tackled the acute housing needs and implemented an urban renewal programme while The EDB was placed in charge of Singapore's industrialization programme.[4] Housing and housing finance are crucial in a state where land is scarce and thus there is a need for the regulation of HDB Flat prices, and use of CPF for mortgage.

The goal of home ownership for all Singaporeans required a housing finance strategy. Public housing was designed to be high-density and low cost. Along with it, schools, community centres, town centres, health clinics, transportation infrastructure was built. For the Home ownership strategy, three main organisations are involved: the Government, the Housing Development Board and the Central provident fund. CPF acts as a social security system that also assists citizens in paying back mortgage loans. Strategies for home ownership included various approaches. For example, low interest loans payable over 20 years was provide and prices of HDB flats were pegged to

[3] Urban Redevelopment Authority, "Our History" in the URA website [downloaded on 1 Dec 2007], available at http://www.ura.gov.sg/about/ura-history.htm

[4] Urban Redevelopment Authority, "Our History" in the URA website [downloaded on 1 Dec 2007], available at http://www.ura.gov.sg/about/ura-history.htm

household income levels.[5]

The Ministry in charge of ensuring adequate public housing for everyone is the Ministry of National Development whose policy is to give every Singaporean a stake in the country and through this aspect feel a sense of ownership for the country.[6] In this sense, there is a nation-building goal tied to the project of public housing. This project has been highly successful because today, 86 per cent of Singaporeans live in public housing flats built by HDB and these homes have also become assets, as 92 per cent of HDB residents own their flats.[7]

Along with the nation-building social goal is the attempt to foster racial harmony by allocating flats in every areas to have a balanced multiracial makeup so that there is a growth of vibrant, thriving multi-racial communities.[8] Other than ensuring multiracial makeup, HDB also tries to ensure greater social mobility between different income classes by having a multi-pronged programme to help the lower-income group own

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[5] Housing Loan, "News and Events" in the Housing Loans website [downloaded on 1 Dec 2007], available at http://www.housingloansg.com/news.htm

[6] Ministry of National Development (MND), "Building Homes, Shaping Communities" in the MND website [downloaded on 13 Dec 2007], available at http://www.mnd.gov.sg/handbook/build_main.htm

[7] Ministry of National Development (MND), "Building Homes, Shaping Communities" in the MND website [downloaded on 13 Dec 2007], available at http://www.mnd.gov.sg/handbook/build_main.htm

[8] Ministry of National Development (MND), "Building Homes, Shaping Communities" in the MND website [downloaded on 13 Dec 2007], available at http://www.mnd.gov.sg/handbook/build_main.htm

HDB flats.[9] For the small minority who cannot afford their own homes, subsidized rental housing is available.[10]

Assistance for Lower-Income Groups is tied closely to economic development. While Singapore's public housing programme has made it a nation of home-owners, there remains a small group of Singaporeans who will need extra help in attaining this dream and this is particularly so as workers without the relevant skills could be marginalized in the New Economy.[11] The Special Housing Assistance Programme was developed to consolidate an array of housing assistance schemes designed to give the lower-income group a chance of upward mobility by providing housing subsidies to help lower-income households own their first flat.[12]

To prevent urban decay and the growth of a new underclass, the Estate Renewal Strategy was put in place to rejuvenate older HDB towns and estates and in so doing, it not only transforms the physical environment of these towns, but also enhances the

[9] Ministry of National Development (MND), "Building Homes, Shaping Communities" in the MND website [downloaded on 13 Dec 2007], available at http://www.mnd.gov.sg/handbook/build_main.htm

[10] Ministry of National Development (MND), "Building Homes, Shaping Communities" in the MND website [downloaded on 13 Dec 2007], available at http://www.mnd.gov.sg/handbook/build_main.htm

[11] Ministry of National Development (MND), "Building Homes, Shaping Communities" in the MND website [downloaded on 13 Dec 2007], available at http://www.mnd.gov.sg/handbook/build_main.htm

[12] Ministry of National Development (MND), "Building Homes, Shaping Communities" in the MND website [downloaded on 13 Dec 2007], available at http://www.mnd.gov.sg/handbook/build_main.htm

asset value of the homes.[13] Lower-skilled workers who have been unable to cope with the demands of the New Economy can enjoy such subsidized housing and divert their limited financial resources to upgrading programs or educational skills training to catch up with the demands of the hi-tech economy.

With the rational allocation of living space for all communities and income classes, there is also a conscious effort to build up a sense of locational and regional identity by building living environments that residents can readily identify with, towns and neighbourhoods incorporate design themes that reflect the heritage or personality of the area.[14] The use of pre-cast technology has given rise to uniquely designed facades, motifs, street and precinct fittings, and other architectural features.[15] Apartment blocks are also grouped in precinct clusters with supporting social and recreational facilities to help heighten residents' sense of belonging.

The introduction of the Home Ownership for the People Scheme in 1964, with its pricing subsidy and attractive mortgage repayment plans, has ensured that prices of new

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[13] Ministry of National Development (MND), "Building Homes, Shaping Communities" in the MND website [downloaded on 13 Dec 2007], available at http://www.mnd.gov.sg/handbook/build_main.htm

[14] Ministry of National Development (MND), "Building Homes, Shaping Communities" in the MND website [downloaded on 13 Dec 2007], available at http://www.mnd.gov.sg/handbook/build_main.htm

[15] Ministry of National Development (MND), "Building Homes, Shaping Communities" in the MND website [downloaded on 13 Dec 2007], available at http://www.mnd.gov.sg/handbook/build_main.htm

HDB flats are kept within the reach of the vast majority of Singaporeans.[16] In addition, allowing the use of Central Provident Fund savings for the purchase of HDB flats has enhanced affordability. Moreover, first-timers can apply for a CPF Housing Grant if they prefer to buy a HDB resale flat.[17]

3. GOVERNMENT EXPENDITURE

Singapore's annual average growth rate of gross fixed capital formation between 1966 and 1972 was 30% compared to 9.1% for private consumption and 17.2% for public consumption.[18] This was mainly accounted for by government construction expenditure and urban renewal projects, such as on high-rise office buildings and shopping complexes. But it was also spent to open up the economy by investing in various technologies and industrial machinery, such as petroleum refining, electronic manufacturing, transport equipment, etc. Government infrastructural expenditure is spent on construction expenditure and urban renewal projects, such as on high-rise office buildings and shopping complexes as well as investments in various technologies and industrial machinery, such as petroleum refining, electronic manufacturing, transport equipment, etc.

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[16] Ministry of National Development (MND), "Building Homes, Shaping Communities" in the MND website [downloaded on 13 Dec 2007], available at http://www.mnd.gov.sg/handbook/build_main.htm

[17] Ministry of National Development (MND), "Building Homes, Shaping Communities" in the MND website [downloaded on 13 Dec 2007], available at http://www.mnd.gov.sg/handbook/build_main.htm

[18] Lan, Chao-Wei, "Singapore's export promotion strategy and economic growth (1965-84) Working Paper No. 16 [downloaded on 1 Dec 2007], available at www.ucl.ac.uk/dpu/publications/working%20papers%20pdf/wp116.pdf

4. CREATING A TRANSPORTATION HUB: PORT AUTHORITY OF SINGAPORE (PSA)

Strategically located at the southern tip of the island, the deep-water seaport of Singapore was the lifeline of Singapore economy during the colonial days, and its present day contribution has remained substantial. Post-colonial governmental policies continued this strategic asset and expanded the deep-water seaport that had been at the heart of Singapore's economy during colonial times. The port has been expanding since 1960s to cope with increasing demand, as the neighbouring hinterlands grow and Singapore needs to strengthen its trade links with major world economies.

The Port Authority of Singapore (PSA) handles about one-fifth of the world's total container transhipment throughput and in 2006, PSA Singapore Terminals handled 23.98 million twenty-foot equivalent units (TEUS) of containers.[19] PSA operates 4 container terminals and 2 multi-purpose terminals in Singapore, and links shippers to an excellent network of 200 shipping lines with connections to 600 ports in 123 countries.[20] Overall, the maritime and logistics industry contributes about 8% to Singapore's GDP. It provides jobs for some 90,000 people, contributing about 1% to our GDP, and employs about 7,000 people.[21]

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[19] PSA, "Welcome to PSA Singapore Terminals" in the PSA website [downloaded on 13 Dec 2007], available at http://www.singaporepsa.com/

[20] PSA, "Welcome to PSA Singapore Terminals" in the PSA website [downloaded on 13 Dec 2007], available at http://www.singaporepsa.com/

[21] Ministry of Transport (MOT), "Speech By Prime Minister Goh Chok Tong At The Port Of Singapore Authority's Gala Dinner To Celebrate 30 Years Of Containerisation In Singapore, Held At The Ritz-Carlton Millenia, On Friday,

The next goal that the Singapore government has in mind for PSA is for the facility to become a global integrated logistics hub, a multi-modal hub, covering and integrating land, sea and air transport.[22] For example, transhipment cargo arriving at PSA will be transported by road to, and flown seamlessly out of Changi Airport and special customs treatment will no longer be restricted just to goods moving within a free trade zone around the seaport or the airport[23].

Being an integrated logistics hub, Singapore has a comprehensive range of "soft" services ancillary to the physical handling of cargo, and which cover the entire maritime and logistics value chain, including insurance, brokerage, arbitration and financing.[24] In other words, Singapore's ports become a facilitator of global logistics networks, and can add even greater value to shipping lines, airlines, logistics players, manufacturers and

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28 June 2002, AT 7.30 PM" in the Ministry of Transport website [downloaded on 13 Dec 2007], available at http://app.mot.gov.sg/data/s_02_06_28.html

[22] Ministry of Transport (MOT), "Speech By Prime Minister Goh Chok Tong At The Port Of Singapore Authority's Gala Dinner To Celebrate 30 Years Of Containerisation In Singapore, Held At The Ritz-Carlton Millenia, On Friday, 28 June 2002, AT 7.30 PM" in the Ministry of Transport website [downloaded on 13 Dec 2007], available at http://app.mot.gov.sg/data/s_02_06_28.html

[23] Ministry of Transport (MOT), "Speech By Prime Minister Goh Chok Tong At The Port Of Singapore Authority's Gala Dinner To Celebrate 30 Years Of Containerisation In Singapore, Held At The Ritz-Carlton Millenia, On Friday, 28 JUNE 2002, AT 7.30 PM" in the Ministry of Transport website [downloaded on 13 Dec 2007], available at http://app.mot.gov.sg/data/s_02_06_28.html

[24] Ministry of Transport (MOT), "Speech By Prime Minister Goh Chok Tong At The Port Of Singapore Authority's Gala Dinner To Celebrate 30 Years Of Containerisation In Singapore, Held At The Ritz-Carlton Millenia, On Friday, 28 June 2002, AT 7.30 PM" in the Ministry of Transport website [downloaded on 13 Dec 2007], available at http://app.mot.gov.sg/data/s_02_06_28.html

traders.[25]

The steps that the government took to achieve the goal of being integrated hub included, first, expanding port capacity to play an even bigger transhipment role, preparing land for another 20 berths.[26] Secondly introducing competition from an alternative port, Jurong Port, and other international players will spur PSA to offer superior services at competitive prices.[27] Thirdly, the port operator has invited business leaders not just onto the PSA Board, but into the Board's Executive Committee to inject a global business and entrepreneurial perspective into the management of the port.

5. CHANGI AIRPORT

The other strategic asset is Singapore's airport facilities. To strengthen trade links with major world economies, the Singapore government's goal is the augmentation and formation of the Future Air Transport Hub. Singapore's first commercial airport had

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[25] Ministry of Transport (MOT), "Speech By Prime Minister Goh Chok Tong At The Port Of Singapore Authority's Gala Dinner To Celebrate 30 Years Of Containerisation In Singapore, Held At The Ritz-Carlton Millenia, On Friday, 28 June 2002, AT 7.30 PM" in the Ministry of Transport website [downloaded on 13 Dec 2007], available at http://app.mot.gov.sg/data/s_02_06_28.html

[26] Ministry of Transport (MOT), "Speech By Prime Minister Goh Chok Tong At The Port Of Singapore Authority's Gala Dinner To Celebrate 30 Years Of Containerisation In Singapore, Held At The Ritz-Carlton Millenia, On Friday, 28 June 2002, At 7.30 Pm" In The Ministry Of Transport Website [Downloaded On 13 Dec 2007], available at http://app.mot.gov.sg/data/s_02_06_28.html

[27] Ministry of Transport (MOT), "Speech By Prime Minister Goh Chok Tong At The Port Of Singapore Authority's Gala Dinner To Celebrate 30 Years Of Containerisation In Singapore, Held At The Ritz-Carlton Millenia, On Friday, 28 June 2002, At 7.30 Pm" In The Ministry Of Transport Website [downloaded on 13 Dec 2007], available at http://app.mot.gov.sg/data/s_02_06_28.html

been based at Paya Lebar, close to residential areas. If Paya Lebar had continued to host the airport, it would have entailed sterilization of large tracts of economically useful lands because of the height control on buildings near the airport. Landing at Paya Lebar Airport also meant that aircrafts had to fly over congested city areas.

In the 1970s, dramatic rise in demand called for the development of reclaimed land at the eastern tip of the island. Changi was chosen as the new site. Some of the reasons for selecting the Changi site were better airport approach via the sea and there were less residential areas affected by air and noise pollution. Changi Airport was redeveloped and expanded from time to time, and has won international acclaim for its high-level services. Other reasons included better road access and no interruption to air traffic movements at Paya Lebar Airport while Changi was under construction.

To sustain Changi's elite hub status, the government opened a Budget Terminal in Oct 2006 and Terminal 3 in Jan 2008. Construction work on Terminal 3 began only 10 years after Terminals 1 and 2 had been completed in 2000 and the terminal is scheduled to open in 2006/2007 at a cost of S$1.5 billion.[28] Designed to handle 20 million, the new terminal will bring capacity at Changi to 64 million—more than 1 million per week.[29]

Changi is a good example of the Singapore's efforts in regionalizing its infrastructure

[28] Airport technology.com, "Changi Airport (SIN/WSSS), Singapore" in the Airport technology.com website [downloaded 1 Dec 2007], available at http://www.airport-technology.com/projects/changi/

[29] Airport technology.com, "Changi Airport (SIN/WSSS), Singapore" in the Airport technology.com website [downloaded 1 Dec 2007], available at http://www.airport-technology.com/projects/changi/

business. Riding the regional aviation boom, 80 airlines now use Changi to fly to more than 180 cities in 50 countries and accounts for the record number of passengers and tourists who go through the airport yearly and the heavy loads of cargo that Changi handles.[30]

Singapore's airport management and its associated and related companies and their infrastructure management have impressed many foreign airport operators, inspiring overseas operators to initiate partnerships and investment opportunities with them. Changi Airport International, for instance, clinched an airport management deal with Abu Dhabi International Airport in early 2007.[31] 10 leading airports in the Middle East are pumping US$23.5 billion into new airports by 2012, providing capacity for 316 million passengers yearly, expanding total airport capacity to 399 million.[32] The Middle East is leading the regions in passenger demand which is growing at 17.8 per cent, outpacing the capacity growth.[33]

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[30] Chuang, Peck Ming, "Riding the regional aviation boom" dated 6 September 2007 in The Business Times [downloaded on 13 December 2007], available at http://ir.asiaone.com/Investor+Relations/Industry+News/Story/A1Story20070906-24378.html

[31] Chuang, Peck Ming, "Riding the regional aviation boom" dated 6 September 2007 in The Business Times [downloaded on 13 December 2007], available at http://ir.asiaone.com/Investor+Relations/Industry+News/Story/A1Story20070906-24378.html

[32] Chuang, Peck Ming, "Riding the regional aviation boom" dated 6 September 2007 in The Business Times [downloaded on 13 December 2007], available at http://ir.asiaone.com/Investor+Relations/Industry+News/Story/A1Story20070906-24378.html

[33] Chuang, Peck Ming, "Riding the regional aviation boom" dated 6 September 2007 in The Business Times [downloaded on 13 December 2007], available at http://ir.asiaone.com/Investor+Relations/Industry+News/Story/A1Story20070906-24378.html

This is the same case for even closer regional airport systems in China and India. China is pouring in S$28 billion over the next five years to build new airports and upgrading existing ones with annual passenger growth in the next 20 years tipped to grow at least at a steady 10.4 per cent yearly.[34] In India, where the aviation market is posting growth of up to 10.4 per cent yearly, the government has issued a mandate for seven greenfield airports and 35 non-metro airports.[35] The Vietnamese government has also got into the act, launching an extensive campaign to spruce up and expand airports as part of a larger attempt to build the country into Asia's fourth biggest aviation market by 2025.[36]

6. PUBLIC TRANSPORTATION SYSTEM

In 1958, road network was sparse. The government constructed roads in a radial pattern converging toward the downtown and took the users-pay approach to tackle congestion. Mass-based public transportation system was also instituted. The Mass Rapid Transit (MRT) is a comprehensive rail network is important a high density city like Singapore. It rapid speed of transportation facilitated CBD as financial hub. 4 years and S$5 billion

[34] Chuang, Peck Ming, "Riding the regional aviation boom" dated 6 September 2007 in The Business Times [downloaded on 13 December 2007], available at http://ir.asiaone.com/Investor+Relations/Industry+News/Story/A1Story20070906-24378.html

[35] Chuang, Peck Ming, "Riding the regional aviation boom" dated 6 September 2007 in The Business Times [downloaded on 13 December 2007], available at http://ir.asiaone.com/Investor+Relations/Industry+News/Story/A1Story20070906-24378.html

[36] Chuang, Peck Ming, "Riding the regional aviation boom" dated 6 September 2007 in The Business Times [downloaded on 13 December 2007], available at http://ir.asiaone.com/Investor+Relations/Industry+News/Story/A1Story20070906-24378.html

later[37], MRT is also popular among public housing dwellers as rail network continues to expand to connect Changi Airport, the North-east of Singapore, Sentosa, Marina area, etc to each other.

7. THE KNOWLEDGE ECONOMY

Physical infrastructure is not sufficient for Singapore to compete in the next lap. Thus, the government has instituted plans for the installation of cutting-edge technologies to utilize, exploit and tap into the next generation of technologies for development. For example, Singapore government's efforts to promote R&D in science and technology included the establishment of the National Science and Technology Board (NSTB). NSTB currently oversees 13 research institutes and centers in Singapore.[38]

7.1. Information technology (IT) Infrastructure

Singapore moved away from low-value adding manufacturing, and global demands have required it to improve its information access. The World Bank estimates that over half of the GDP in the major high income OECD countries is built on the production and distribution of knowledge. Since the 1980s, however, the information revolution has nullified its geographical advantages, though the strategically located seaport and airport have remained important. The rule of this new global economic game has shifted

[37] Phang, Sock-Yong, "Strategic development of airport and rail infrastructure: the case of Singapore" Vol. 10 Issue 1 Jan 2003, in Science Direct [downloaded on 1 Dec 2007], available at linkinghub.elsevier.com/retrieve/pii/S0967070X02000276, pp. 27-33.

[38] Adams, Francis Gerard and William E. James, Public Policies in East Asian Development: Facing New Challenges,(Praeger/Greenwood), 1999, p. 130.

to the quality of information access, and its support services and skills to support the productivity gains of Singapore's workforce and to maintain its competitive edge. Use of information technology to stimulate economic growth and achieve national competitiveness then becomes important in Singapore's IT development.

Table 1: Singapore Government's IT Infrastructure Plans

1981	The National Computer Board (NCB)
1996	5-year National Science and Technology Plan 2000
1991	Comprehensive information technology plan called "IT 2000" was launched "Singapore ONE" was undertaken to deliver high-speed internet telecommunications
1998	E-commerce master plan was launched along with the Local Enterprise E-Commerce Program

Source: Choo, Chun Wei, "IT2000: Singapore's Vision of an Intelligent Island Chun Wei Choo" adapted from Book chapter in "Intelligent Environments," edited by Peter Droege, published by North-Holland (1997) [downloaded on 1 Dec 2007], avialable at http://choo.fis.utoronto.ca/FIS/ResPub/IT2000.html

In 1981, the National Computer Board (NCB) was created to coordinate computer education and training aimed at supporting industries with appropriate IT manpower. In 1991, the NCB solidified its plan to link up the businesses in Singapore with the world, especially with those developed IT centres in the West including Japan. A comprehensive information technology plan called "IT 2000" was launched in 1991 as a framework to guide Singapore IT development into the 21st century. In line with it was an advanced National Information Infrastructure that was developed to link computers and other information appliances in homes, offices, schools, factories across the country. A nation-wide broadband structure called "Singapore ONE" was undertaken to deliver high-speed internet telecommunications.

In establishing such a globalisation network, the aim was that marketing of high value-added products from Singapore would be designed and manufactured for on time delivery and at minimal costs. In 1996, a 5-year National Science and Technology Plan 2000 costing S$4.0 billion was initiated to carry out the restructuring and upgrading of Singapore's industry and business clusters.[39] The Singapore Government also took on an active role in the establishment of e-commerce infrastructure, which is the use of inter-networked computers to create and transform business relationships. The e-commerce master plan was launched in Sept 1998 to drive the use of electronic commerce. The government launched the Local Enterprise E-Commerce Program (budget $9 million)[40] in November 1998 to encourage local companies to implement e-commerce in their business operations.

The characteristics of a regional e-trade hub largely consist of marketplaces (such as the energy exchanges, chemical exchanges, palm oil and rubber exchange, textile market and pulp and paper networks) and business enablers (such as trade documentation, intra-regional and inter-regional integration). The manufacturing and logistics sectors have played a major role in Singapore's industrialisation and economic development. Many of these companies are leveraging on the Internet to effectively manage and

[39] Wong, Tai-Chee, "The transition from physical infrastructure to infostructure: infrastructure as a modernizing agent in Singapore" in GeoJournal Vol. 49 Numveber 3/November 1999 [downloaded on 1 Dec 2007], available at http://www.springerlink.com/content/n20850m77rg53rq8/

[40] IDA Singapore, "eBids - Accelerating e-Commerce Development & Growth in Singapore" in IDA Singapore website [downloaded on 1 Dec 2007], available at http://www.ida.gov.sg/News%20and%20Events/20061213164252.aspx?getPagetype=21

optimize their supply chain processes and fulfilment needs. These sectors influence other industries as the value chain begins with manufacturing while logistics play a huge supporting role. The repetitive nature of financial transactions, combined with well-established information systems, also allow banks to reap significant cost savings from online delivery of services.

iN2015 is the latest blueprint to navigate Singapore's exhilarating transition into a global city, universally recognised as an enviable synthesis of technology, infrastructure, enterprise and manpower with the aim that, in less than ten years, every single person and business in Singapore will find the world - and everyday life - transformed by technology.[41] Led by the Infocomm Development Authority of Singapore (IDA), iN2015 is a multi-agency effort that is the result of private, public and people sector co-creation.[42] The vision is to turn the country into an Intelligent Nation and Global City, powered by infocomm.[43] The masterplan recommends the way forward for Singapore, into a future where infocomm will bring a sea change and become intrinsic in the way people live, learn, work and play.

The iN2015 masterplan is developed in the past year with inputs from the People, Private and Public sectors with a steering committee chaired by IDA and representatives

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[41] IDA Singapore, "About iN2015" [downloaded on 16 Dec 2007], available at http://www.in2015.sg/

[42] IDA Singapore, "About iN2015" [downloaded on 16 Dec 2007], available at http://www.in2015.sg/

[43] IDA Singapore, "Singapore iN2015 Masterplan Offers a Digital Future for Everyone" dated 20 June 2006 in the IDA website [downloaded on 16 Dec 2007], available at http://www.ida.gov.sg/News%20and%20Events/20050703161451.aspx?getPagetype=20

from the infocomm industry, sectors like education, healthcare, manufacturing & logistics, finance, tourism & retail and digital media, as well as the government, guided the development.[44] The goals are ambitiously to achieve a two-fold increase in value-added1 of the infocomm industry to S$26 billion, see a three-fold increase in infocomm export revenue to S$60 billion, create 80,000 additional jobs, have at least 90 per cent of homes using broadband and ensure 100 per cent computer ownership for all homes with school-going children.[45]

To achieve the targets, the masterplan outlined four key strategies: to spearhead the transformation of key economic sectors, government and society through more sophisticated and innovative use of infocomm; to establish an ultra-high speed, pervasive, intelligent and trusted infocomm infrastructure; to develop a globally competitive infocomm industry; to develop an infocomm-savvy workforce and globally competitive infocomm manpower.[46]

The Next Generation National Infocomm Infrastructure put in place by 2012 is capable

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[44] IDA Singapore, "Singapore iN2015 Masterplan Offers a Digital Future for Everyone" dated 20 June 2006 in the IDA website [downloaded on 16 Dec 2007], available at http://www.ida.gov.sg/News%20and%20Events/20050703161451.aspx?getPagetype=20

[45] IDA Singapore, "Singapore iN2015 Masterplan Offers a Digital Future for Everyone" dated 20 June 2006 in the IDA website [downloaded on 16 Dec 2007], available at http://www.ida.gov.sg/News%20and%20Events/20050703161451.aspx?getPagetype=20

[46] IDA Singapore, "Singapore iN2015 Masterplan Offers a Digital Future for Everyone" dated 20 June 2006 in the IDA website [downloaded on 16 Dec 2007], available at http://www.ida.gov.sg/News%20and%20Events/20050703161451.aspx?getPagetype=20

of delivering broadband speeds up to 1 Gbps, and offer pervasive connectivity around the country and the infrastructure will also be IPv6 compliant, enabling an exciting host of new broadband-enabled services and applications, such as immersive learning experiences, telemedicine, high definition TV, immersive video conferencing and grid computing.[47]

To support the growth of the economy and the infocomm industry, the infocomm competencies of the general workforce will be raised with techno-strategists who have both the technical and business expertise groomed to achieve business and organisational goals through the strategic and innovative use of infocomm and to build a pipeline of infocomm professionals, there will be initiatives to attract the best from schools to take up infocomm as a career.[48]

7.2. BioTech

Singapore is attempting to lure major companies like those that conduct research into stem cells with fewer restrictions on embryo cloning compared to the United States.[49]

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[47] IDA Singapore, "Singapore iN2015 Masterplan Offers a Digital Future for Everyone" dated 20 June 2006 in the IDA website [downloaded on 16 Dec 2007], available at http://www.ida.gov.sg/News%20and%20Events/20050703161451.aspx?getPagetype=20

[48] IDA Singapore, "Singapore iN2015 Masterplan Offers a Digital Future for Everyone" dated 20 June 2006 in the IDA website [downloaded on 16 Dec 2007], available at http://www.ida.gov.sg/News%20and%20Events/20050703161451.aspx?getPagetype=20

[49] O Sullivan, Phil, "SINGAPORE'S BIOTECH BET" in CNN website dated 3 December 2003, [downloaded on 1 Dec 2007], available at www.cnn.com/2003/WORLD/asiapcf/12/03/trends.singaporebiotech.reut/index.html

Singapore opened a new complex to house biotech scientists and their companies called the Biopolis, a three hundred million dollar symbol of Singapore's biotech industry. The government is offering tax breaks, grants and other incentives worth up to one-point-three billion dollars aimed at attracting the best and brightest of the biotech world.[50] The chairman of Singapore's Agency for Science, Technology and Research sums it up: "We cannot compete with America," he says; "We cannot compete with Europe. We must look for areas and the advantage is that we are in Asia, and we must look for diseases that are relevant to our domain and some areas of stem cells where some countries are not very keen in such things. So we must look for those areas to create a niche."[51]

The government also instituted the One-North: Biotech project to tap into the booming biotech industry. Conceived as the cornerstone of a much broader vision to build up the biomedical sciences industry in Singapore, the Biopolis is a purpose-built biomedical research hub where researchers from the public and private sectors are co-located and is situated in the south-western part of Singapore, the Biopolis is within walking distance of the Buona Vista MRT Station and is near both the National University of Singapore and the National University Hospital.[52] The entire Biopolis at one-north, comprising

[50] O Sullivan, Phil, "Singapore's Biotech Bet" in CNN website dated 3 December 2003, [downloaded on 1 Dec 2007], available at www.cnn.com/2003/WORLD/asiapcf/12/03/trends.singaporebiotech.reut/index.html

[51] O Sullivan, Phil, "Singapore's Biotech Bet" in CNN website dated 3 December 2003, [downloaded on 1 Dec 2007], available at www.cnn.com/2003/WORLD/asiapcf/12/03/trends.singaporebiotech.reut/index.html

[52] Agency for Science, Technology and Research A Star, "Biopolis" in Astar website [downloaded on 1 Dec 2007], available at http://www.a-star.edu.sg/astar/biopolis/index.do

20ha of land is dedicated to cutting-edge biomedical research and development facilities.[53]

Phase 1 of Biopolis comprises of a seven-building complex linked by skybridges and offers a built-up area of 185,000 sqm and two buildings, Chromos and Helios, are dedicated to biomedical players from the private sector.[54] The other five buildings (Centros, Genome, Matrix, Nanos and Proteos) house five of the seven biomedical research institutes under the Agency of Science, Technology and Research (A*STAR), Singapore's lead agency for scientific research and development under the aegis of the Ministry of Trade and Industry and they are the BioInformatics Institute (BII), the Bioprocessing Technology Institute (BTI), the Genome Institute of Singapore (GIS), the Institute of Bioengineering & Nanotechnology (IBN) and the Institute of Molecular and Cell Biology (IMCB).[55]

This research community is fully supported by state-of-the-art infrastructure including shared resources and services catering to the full spectrum of R&D activities and

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[53] One North, "Life Xchange - Biopolis Phase 3 Concept and Fixed Price Tender" [downloaded on 14 Dec 2007], available at http://www.one-north.sg/TendProp_BiopolisP3.aspx

[54] Agency for Science, Technology and Research A Star, "Biopolis" in Astar website [downloaded on 1 Dec 2007], available at http://www.a-star.edu.sg/astar/biopolis/index.do

[55] Agency for Science, Technology and Research A Star, "Biopolis" in Astar website [downloaded on 1 Dec 2007], available at http://www.a-star.edu.sg/astar/biopolis/index.do

graduate training.[56] Phase 2 of Biopolis, which adds another 37,000 sqm of built-up area, was opened in October 2006 and is expected to achieve occupancy by end 2007 and two new buildings, Neuros and Immunos, will house public research units as well as corporate R&D laboratories. Biopolis is part of a master plan for a much larger 200-hectare development known as one-north and there are provisions for expansion to cater to a growing demand for biomedical R&D space.[57]

Following the completion of Biopolis Phase 1 and 2, the Singapore government is anticipating the demand for more biomedical R&D space beyond 2007 and so the one-north Master Plan identifies the land south of the Biopolis for future development of biomedical facilities.[58] Targeting mainly private research institutes and incubator research activities, Biopolis 3 is a multi-tenanted research facility which will bridge private and public sector research work by encouraging close collaboration and is intended to extend basic research activities into other segments of translational and clinical research, as well as medical technology (MedTech) research.[59]

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[56] Agency for Science, Technology and Research A Star, "Biopolis" in Astar website [downloaded on 1 Dec 2007], available at http://www.a-star.edu.sg/astar/biopolis/index.do

[57] Agency for Science, Technology and Research A Star, "Biopolis" in Astar website [downloaded on 1 Dec 2007], available at http://www.a-star.edu.sg/astar/biopolis/index.do

[58] One North, "Life Xchange - Biopolis Phase 3 Concept and Fixed Price Tender" [downloaded on 14 Dec 2007], available at http://www.one-north.sg/TendProp_BiopolisP3.aspx

[59] One North, "Life Xchange - Biopolis Phase 3 Concept and Fixed Price Tender" [downloaded on 14 Dec 2007], available at

http://www.one-north.sg/TendProp_BiopolisP3.aspx

Singapore also adopts a clustering strategies spearheaded by the Singapore Biomedical Sciences (BMS) initiative launched in June 2000 to develop the Biomedical Sciences cluster.[60] Three key agencies work in close coordination and in an integrated fashion to develop the BMS cluster: the Biomedical Research Council (BMRC) of the Agency for Science, Technology and Research (A*STAR) funds and supports public research initiatives, the Economic Development Board's (EDB) Biomedical Sciences Group (BMSG) promotes private sector manufacturing and R&D activities, and EDB's Bio*One Capital functions as an investment arm.[61]

The first phase of development (2000-2005) of the Biomedical Sciences (BMS) initiative was focused on establishing a firm foundation of basic biomedical research in Singapore and, in the second phase (2006-2010), the focus is on deepening our basic research capabilities and strengthening translational and clinical research (TCR) to help realise the full potential of our investments in the BMS initiative with the translation of laboratory discoveries to clinically useful and commercially viable applications.[62]

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[60] Agency for Science Technology and Research, "The BMS Initiative" in the A-star website [downloaded on 16 Dec 2007], available at http://www.a-star.gov.sg/astar/biomed/action/biomed_bms.do;jsessionid=FAA37109E8ABB20A66BDF3B973BD835D

[61] Agency for Science Technology and Research, "The BMS Initiative" in the A-star website [downloaded on 16 Dec 2007], available at http://www.a-star.gov.sg/astar/biomed/action/biomed_bms.do;jsessionid=FAA37109E8ABB20A66BDF3B973BD835D

[62] Agency for Science Technology and Research, "The BMS Initiative" in the A-star website [downloaded on 16 Dec 2007], available at

BMRC's seven research institutes develop core research capabilities in the areas of bioprocessing, chemical synthesis, genomics and proteomics, molecular and cell biology, bioengineering and nanotechnology and computational biology, as well as bridge the gap between bench and bedside and it has also launched consortial initiatives to focus on developing capabilities in translational research, such as the Singapore Cancer Syndicate, Singapore Bioimaging Consortium, Singapore Stem Cell Consortium, Singapore Consortium of Cohort Studies and Singapore Immunology Network.[63]

These consortia also optimize Singapore's available resources, allowing for integrated development in strategic areas of biomedical research. In a partnership between BMRC and sister council, the Science and Engineering Research Council, the Institute of Chemical and Engineering Sciences' Chemical Synthesis Laboratory @ Biopolis provides capabilities in chemistry. All these research capabilities support the BMS cluster, comprising the four key sectors: pharmaceuticals, biotechnology, medical technology and healthcare services.[64]

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http://www.a-star.gov.sg/astar/biomed/action/biomed_bms.do;jsessionid=FAA37109E8ABB20A66BDF3B973BD835D

[63] Agency for Science Technology and Research, "The BMS Initiative" in the A-star website [downloaded on 16 Dec 2007], available at http://www.a-star.gov.sg/astar/biomed/action/biomed_bms.do;jsessionid=FAA37109E8ABB20A66BDF3B973BD835D

[64] Agency for Science Technology and Research, "The BMS Initiative" in the A-star website [downloaded on 16 Dec 2007], available at http://www.a-star.gov.sg/astar/biomed/action/biomed_bms.do;jsessionid=FAA37109E8ABB20A66BDF3B973BD835D

8. THE SERVICE OPTION

In trying to capture revenue from the hitech industry, Singapore is not forgetting its former niche of the service industry, especially tourism and the newly conceptualized strategy of integrated resort.

8.1. Tourist Destination

Over the last few years, Singapore has seen strong double digit growth of Chinese visitors arriving in Singapore. This upward trend is expected to continue in the coming years as China continues to develop, and the people become more well-off and travel more. In order to cater for Chinese visitors who have little or no command of English, and visiting Singapore for their first time, we will need to gear up in terms of introducing multi-lingual tourist sign system to take advantage of the growth in Chinese outbound travel. Another two major groups of visitors who are not conversant in the English language are the Indonesians and Japanese. The Indonesians are our first largest group of tourist arrivals while the Japanese form the second group. Older Chinese and Malay Singaporeans too, have also expressed same difficulty as they do not understand nor read English.

To tap into this growth markets, Singapore Tourism Board sources and facilitates procurement of land to meet tourism businesses' needs. The government facilitates setting up visual communication structure, multi-language signage (for non-English speakers as stated above) and brown signs for tourists. Public facilities include: New

Shopping Districts, New Places of Interest, e.g. Singapore Flyer, Integrated Resorts, Multi-Lingual Tourist Sign System.

8.2. Integrated Resorts

Perhaps the most significant infrastructure complement to the regional tourism boom is the construction of Integrated Resorts in Singapore. The strategic objective of the Integrated Resorts is to broaden our leisure and entertainment options to enhance Singapore's reputation as a premium "must-visit" destination for leisure and business visitors and to tap into the growth of the Asia Pacific tourism market, fuelled by the growing middle class in China, India and ASEAN as well as the emergence of low cost airlines, present significant opportunities.[65] Singapore wants to capture its fair share of the growing tourism pie because many countries in the region are moving quickly to develop major tourist attractions and new tourism products.[66]

Similar to major resorts in places such as the Bahamas and Las Vegas, the Integrated Resorts in Singapore are envisaged to be distinctive world-class developments with a comprehensive range of amenities such as hotels, convention facilities, entertainment shows, theme attractions, luxury retail, fine dining and casino gaming.[67] The Integrated

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[65] Ministry of Trade and Industry (MTI) Singapore, "Developing industries Integrated resorts" in the MIT website [downloaded on 1 Dec 2007], available at http://app.mti.gov.sg/default.asp?id=585

[66] Ministry of Trade and Industry (MTI) Singapore, "Developing industries Integrated resorts" in the MIT website [downloaded on 1 Dec 2007], available at http://app.mti.gov.sg/default.asp?id=585

[67] Ministry of Trade and Industry (MTI) Singapore, "Developing industries Integrated resorts" in the MIT website [downloaded on 1 Dec 2007], available at http://app.mti.gov.sg/default.asp?id=585

Resorts will be part of a larger spectrum of tourism products we are developing to enhance our destination appeal. It is one of the many strategies that we are pursuing to widen the range of entertainment options in Singapore and ensure that the tourism sector remains a key contributor to the economy.[68]

9. CONCLUDING TRENDS

There is an increasing trend towards privatization of infrastructure construction to the private sector as this may spread risks to a wider range of participants who may be better equipped than governments to deal with the risks. In Singapore, this was enunciated by a high-ranking civil servant on 21 Sep 2006. Mr Lee Chuan Teck, Executive Director, Monetary Authority of Singapore observed: "While a large part of Asia's infrastructure development will be financed from governments' balance sheet, an increasing proportion of private investment is desirable, if not critical."[69] In other parts of Southeast Asia, Indonesia, Vietnam and Philippines will also need substantial amounts of infrastructure development, between 50 to 60 billion US dollars per year and to fulfill even half the development outlined in the joint study equates to an expenditure of more than 3% of GDP per year.[70] In most countries, it would be

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[68] Ministry of Trade and Industry (MTI) Singapore, "Developing industries Integrated resorts" in the MIT website [downloaded on 1 Dec 2007], available at http://app.mti.gov.sg/default.asp?id=585

[69] Monetary Authority of Singapore (MAS), "Speech by Mr Lee Chuan Teck, Executive Director, Monetary Authority of Singapore, at the Public Lender & Insurer Infrastructure Finance Summit 2006 on 21 Sep 2006" in the MAS website [downloaded on 1 Dec 2007], available at http://www.mas.gov.sg/news_room/statements/2006/The_Public_Lender_n_Insurer_Infrastructure_Summit.html

[70] Monetary Authority of Singapore (MAS), "Speech by Mr Lee Chuan Teck, Executive Director, Monetary Authority of Singapore, at the Public Lender & Insurer Infrastructure Finance Summit 2006 on 21 Sep 2006" in the

prohibitively expensive, if not politically impossible, to do so with pure fiscal funding and may also divert precious resources away from equally pressing priorities such as health care and education."[71]

These investors will demand a broader range of investment products, ranging from conventional instruments like bank deposits, government debentures, publicly listed bonds and stocks to at the other extreme alternative investments like hedge funds and private equity.[72] In the middle of 2006, Macquarie launched an infrastructure fund in Singapore, the first of its kind in Asia which was very successful and more than S$800m was raised and the issue was over-subscribed 17.9 times at the institutional level, and 12.7 times at the retail level.[73]

Other infrastructure strategies in the pipeline would be maintaining high growth via

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MAS website [downloaded on 1 Dec 2007], available at http://www.mas.gov.sg/news_room/statements/2006/The_Public_Lender_n_Insurer_Infrastructure_Summit.html

[71] Monetary Authority of Singapore (MAS), "Speech by Mr Lee Chuan Teck, Executive Director, Monetary Authority of Singapore, at the Public Lender & Insurer Infrastructure Finance Summit 2006 on 21 Sep 2006" in the MAS website [downloaded on 1 Dec 2007], available at http://www.mas.gov.sg/news_room/statements/2006/The_Public_Lender_n_Insurer_Infrastructure_Summit.html

[72] Monetary Authority of Singapore (MAS), "Speech by Mr Lee Chuan Teck, Executive Director, Monetary Authority of Singapore, at the Public Lender & Insurer Infrastructure Finance Summit 2006 on 21 Sep 2006" in the MAS website [downloaded on 1 Dec 2007], available at http://www.mas.gov.sg/news_room/statements/2006/The_Public_Lender_n_Insurer_Infrastructure_Summit.html

[73] Monetary Authority of Singapore (MAS), "Speech by Mr Lee Chuan Teck, Executive Director, Monetary Authority of Singapore, at the Public Lender & Insurer Infrastructure Finance Summit 2006 on 21 Sep 2006" in the MAS website [downloaded on 1 Dec 2007], available at http://www.mas.gov.sg/news_room/statements/2006/The_Public_Lender_n_Insurer_Infrastructure_Summit.html

technology-intensive industries, continually finding niches in global economy and augmenting cluster development plans. Clustering involves grouping industries together e.g. One-North, Jurong Island, Science Park 1 and 2. In terms of finding global niches, Singapore has turned its infrastructure development experience into a successful and profitable business. For example, it has invested in the Suzhou Industrial Park (SIP) in China, International Tech Park Limited Bangalore India and the Batamindo Industrial Park in Indonesia. SIP's GDP grew by 18.8% to reach RMB 68 billion and attracted US$ 1.6 billion in utilized FDI last year. [74] During the past decade, SIP has seen quick development and the chief economic indices all grow at a rate of around 50%.[75] In 2003 alone, the investment in fixed assets in SIP exceeded 20.2 billion yuan.[76]

In South Asia, the International Tech Park Limited in Bangalore India offers total business space solutions which assures guaranteed uninterrupted power supply and telecommunication facilities, immediate occupancy, business incubator space. It is also a one-stop service within a state-of-the-art technology park, attracting tenants, more than half of whom are well-known conglomerates e.g. AT&T, IBM, Motorola, Sony, Texas Instruments, Citicorp. One reason for its success is that it 'cuts through the red

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[74] Ministry of Trade and Industry (MTI), "(SIP) 9TH Joint Steering Council Endorses New Thrusts To Promote The Continued Growth Of SIP" dated 10 July 2007 in the MTI website [downloaded on 1 Dec 2007], available at http://app.mti.gov.sg/default.asp?id=148&articleID=9081

[75] People's Daily, "Vice-Premier Urges Boost for Suzhou Industrial Park" dated 9 June 2001 in People's Daily website [downloaded on 1 Dec 2007], available at http://english.peopledaily.com.cn/200106/09/eng20010609_72197.html

[76] Business-in-Asia.com, "Industrial Park in Suzhou, China" in the Business in Asia.com website [downloaded on 1 Dec 2007], available at http://www.business-in-asia.com/suzhou.htm

tape and bottlenecks that are a part of India's infrastructure and operating environment'.

Nearer to home, for the Batamindo Industrial Park Indonesia, Singapore tapped into the Riau islands' location-specific advantages such as abundant land and cheap labour in contrast to Singapore's land and labour constraints. Another Southeast Asian example is the Vietnam-Singapore Industrial Park which is developed as a 'hassle-free' one-stop service: self-contained, self-sufficient industrial park with prepared land plots, and ready-built factories, bolstered by Singapore-style management expertise and infrastructure support. Training for the Park is provided at the Vietnam-Singapore Technical Training Centre which was established in 1998. The Park has a broad swathe of industries: food, electrical and electronics, pharmaceuticals and healthcare, specialty materials, consumer goods and light industries.

10. POLICY RECOMMENDATIONS

1.Infrastructure development (hardware) combined with public administration development (software) has been the key to Singapore's economic transformation from a Third World to a First World country within 30 years. Singapore's experience has definitely proven that hardware and software development of infrastructure are important and must be undertaken simultaneously;

2.Infrastructure development must be based on long-term planning based on economically viable project and managed on commercial-based practices;

3.At least in the initial stage, efficiency criterion should be the primary guideline, rather than equity objective;

4.The role and involvement of the private sector should be encouraged as the private sector often sets the standard of efficiency and benchmarking of quality and competitiveness;

5.Infrastructure development should be operated on the principle of transparency and accountability with respect to public tender for projects and management operation;

6.Master Plan of infrastructure development should be drafted on a long-term strategic objective based on overall planning, efficiency, competition, clustering and cost and benefit analysis which includes economic an social development objectives;

7.In the past, financing infrastructure development was covered from national development budget and issuance of long-term sovereign bond and external official development assistance (ODA). As East Asian countries have accumulated so much official reserves, estimated around USD 3 trillion, there should be an initiative to put aside part of the accumulated reserves earmarked for regional infrastructure development.

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Chapter 9: Infrastructure Development in Thailand

Narong Pomlaktong and Sumet Ongkittikul

Abstract

This report describes Thailand's infrastructure development. It report begins with a discussion on the current status of infrastructure development in Thailand. It then describes the country's infrastructure development plans. Furthermore, three important issues of the infrastructure development are highlighted, namely, modal shift and intermodal transport; cross-border transport agreement for market integration; and infrastructure pricing. Finally, the report provides policy recommendations. First, the government should develop the policy documents to set up the strategies and directions for infrastructure development in each transport sector. Second, it should invest in transport infrastructure, especially intercity motorways and railway improvement. Third, the government should facilitate improvements of law, regulations, and rules that facilitate the management of the transport sector. Among others, it should have a law which specifies that an independent organization could be set up as a regulator for the transport sector. Fourth, the government should enhance the regional integration through cross-border trade. Finally, the government should accelerating the creation of Public Service Agreement.

1. STATUS OF INFRASTRUCTURE DEVELOPMENT IN THAILAND

Table 1 shows an overview of the transport infrastructure in Thailand.

Table 1: Transportation and Logistics-Related Infrastructures: An Overview

Mode	Details
Highways:	*Total:*61,586 km *Paved:*61,238 km *Unpaved:* 348 km
Railways:	*Total:*4,071 km *Narrow gauge:* 4,071 km 1.000-m gauge
Waterways:	4,000km *Note:* 3,701 km navigable by boats with drafts up to 0.9 m
Merchant marine:	*Total:* 386 ships (1,000 GRT or over) 2,038,597 GRT/3,104,712 DWT *By type:* bulk carrier 57, cargo 142, chemical tanker 12, combination ore/oil 1, container 21, liquefied gas 25, passenger 3, passenger/cargo 4, petroleum tanker 89, refrigerated cargo 30, roll on/roll off 1, specialized tanker 1 *Foreign-owned:* 55 (Indonesia 1, Japan 3, Norway 45, Singapore 6) *Registered in other countries:* 35
Ports and harbors	*(Major ports)* *Bangkok, Laem Chabang, Map Ta Phut Port, Songkhla, Phuket, Sriracha, Siam Sea Port*
Airports - with paved runways	*Total:* 65 *Over 3,047 meter:*7 *2,438 to 3,047 meter:*10 *1,524 to 2,437 meter:*23 *914 to 1,523 meter:*19 *under 914 meter:* 6
Airports - with unpaved runways	*Total:*44 *1,524 to 2,437 meter:*1 *914 to1,523 meter:*15 *under 914 meter:* 28
Heliports	3
Pipelines	Gas 3,112 km; refined products 265 km

Mode	Details
Transport nodes	*Truck terminals*: 3 public terminals *Off-dock container freight stations:* 16 stations permitted *Inland container depot:* 4 ICDs (including 1 publicly owned) *Container yards:* 21 yards *Warehouses:* 83 public warehouses *Silo:* 13 silos *Cold storage:* 102 storages *Bonded warehouse:* 146 manufacturing bonded warehouses, 30 general bonded warehouses, 22 duty-free shop bonded warehouses, 3 general bonded warehouses for exhibitions, 1 general bonded warehouse for gasoline storage, 18 dock-yard bonded warehouses, 18 bonded warehouses for free trading activities *Industrial estates:* 33 locations
Logistics service providers	*Total:* 300 providers

Source: The "Report on the Study of Potential Transportation Networks and Alternative Linkage Strategies (2006)." Office of Transport and Traffic Policy and Planning.

1.1 Road Transport Infrastructure

1.1.1. Road network and Nodes

Thailand has the necessary basic infrastructure in the form of well-connected roads and highway networks across the country. To boost the road infrastructure, the Thai government is planning to construct 4,150 km of motorways across the country, connecting the east-west and north-south economic corridors.

There are currently a number of nodes that provide multi-modal transfer points for air and sea shipments, which facilitate trade services catering to major products and goods, namely, Truck Terminals, Off-dock Container Freight Station (CFS), Inland Container Depots (ICDs), Container Yards, and Product Storage Areas.

1.1.2. Road connections with neighboring countries

Thailand has an important strategic advantage regarding roadway services, connecting to Myanmar in the north and west, Lao People's Democratic Republic (Lao PDR) in the northeast, Cambodia in the east, and Malaysia in the south. Transportation and logistics from Thailand to southern China is also possible via these neighboring countries, particularly Lao PDR and Myanmar.

The trade routes and border points are generally in good condition. This notwithstanding, the Thai government has endorsed several projects that are aimed at improving the infrastructure of its neighbors along the border areas.

1.1.3. Problems and limitations

Thailand is faced with specific limitations in road transportation on top of other major problems such as high traffic volume, geometry of roadways, lack of parking space for large vehicles, noise, pollution and heavy fuel consumption.

(1) A truck may not pass between two states and goods must be transferred to another truck that belongs to the neighboring country. This generates extra costs in addition to time wasted and a high possibility that products may be damaged.
(2) Overloading of trucks may result in high road maintainance costs.
(3) Laws and regulations relating to logistics and transportation sector have not been enforced strictly up to international standards.

1.2. Railway Freight Transport

1.2.1. Networks and node

Train transportation often lacks fluidity and may have delays when changing locomotives at train stations or nodes. Furthermore, other locomotives do not satisfy logistics demands. Thailand has an estimated 4,180 km of rail tracks that connect 46 provinces.

Thailand has three types of rail tracks at present: single, dual, and triple tracks. Single tracks total 3,901 km (93.3 percent of total railways), while dual and triple tracks constitute 220 km (5.3 percent) and 59 km (1.4 percent), respectively.

1.2.2. Problems and Limitations

Problems and limitations of the railway sector in Thailand can be identified as follows:

(1) Occurrence of rail accidents mainly due to the lack of signaling equipment at various roads railways junctions.
(2) Lack of protective equipment in 2,300 areas across the country where roads and railways intersect, most of which have only warning devices.
(3) Congestion at ICD Lat Krabang – Laem Chabang Port.
(4) The tracks used in carrying shipments (except for boxed products) between Lat Krabang and Laem Chabang Port are single-track, which often cause delays due to the necessity of switching tracks.
(5) Insufficient locomotives to meet demands.

1.3. Waterways Transport

1.3.1. Networks and nodes

1. Inland waterway freight transport

Routes in Thailand include the Chao Phraya, Pa Sak, Bang Pakong, Mae Klong and Tha Chin rivers. Inland waterways enable international ships to travel south to Bangkok through the Chao Phraya River, from where they transfer their cargo to smaller carriage ships owing to the limits imposed by the size of the river.

2. International waterway freight transport

The international routes are via the Mekong River, which passes through China, Myanmar, Thailand, Lao PDR, Cambodia and Vietnam.

International freight transport along the Mekong River is mostly related to commerce with southern China, which is using Chiang Saen port in Thailand, and Chiang Rung and Sur Maoh ports in southern China There is also freight transport between Thailand and Lao PDR through the Chiang Khong Port in Thailand and the Luang Prabang city in Lao PDR.

3. Coastal Network

Sea transport remains the key to Thailand's international trading activities and its volume is increasing on a year-to-year basis.

4. Inland Waterway Transport – Bangkok and Vicinity

Ports along the Chao Phraya River are mostly operated by the private sector. There are 61 ports along both sides of the Chao Phraya River at present, each of which could take cargo ships weighing up to 500 gross tons. These are mainly used for shipping cargo from the Bangkok port to Sichang Island in the Gulf.

Six ports are currently used for transporting containers and authorized as public harbors for international ships. These ports are as follows:

(a)Two ports along the east bank of the Chao Phraya River

(b)Four ports along the west bank of the Chao Phraya River

5. International Waterway Port

There are two international waterway ports, namely, Chiang Saen Port and Chiang Khong Port, both located in the Chiang Rai Province. The Chiang Saen Port support 200 to 300 gross ton ships, and it is usually used for transporting both conventional and container cargo. Chiang Khong Port can support two to three 100 gross ton-ships at the same time and is specifically used for international freight transport.

6. Coastal Network

The main international ports in Thailand that are operated by the government are as follows:

a. Bangkok Port. The port can accommodate ships with an average draught of 8.5 to 11 meters from mean sea level (MSL) but cannot support vessels that are longer than 172 meters, heavier than 12,000 DWT, or have a draught deeper than 8.2 meters from MSL.

b. Laem Chabang Port. It is the largest freight transport port in Thailand and is approximately 14 meters deep from MSL and can support post Panamax vessels containing 5,000 TEUs. The port's link to the port of Seattle in the United States helps reduce cargos handling and checking processes at ports in the United States.

c. Map Ta Phut Port. Located on the coast of Rayong Province, approximately 220 km southeast of Bangkok, this port has a watercourse of 8 to 12.5 meters deep from MSL. This facility is the only transport mode connecting to this port.

d. Songkhla Port. Lying 100 km north of the Thailand-Malaysia border in Songkhla Province, the port has a watercourse of approximately 9 meters deep from MSL; land transport is the only mode connecting to this port. This port cannot, however, support vessels that are longer than 173 meters, heavier than 12,000 DWT, or have an average draught deeper than 7 meters from MSL.

e. Phuket Port. Lying in the southwestern region of Thailand, the port's watercourse measures approximately 9 meters in depth from MSL; land transport is the only transport mode connecting to this port. This port cannot support vessels that are longer than 210 meters, heavier than 20,000 DWT, or a draught deeper than 8.5 meters from water surface.

f. Sriracha Harbor Pier. Located about 122 km southeast of Bangkok, the four-terminal pier can support vessels with a draught of less than 14.5 meters from MSL; the only form of intermodal transport connecting to this port is land transport.

g. Siam Sea Port. Located in Sriracha District, Chon Buri Province, the port can support vessels ranging from 500 to 60,000 DWT, with a draught of 14.5 meters from MSL. This port has 22 warehouses with a total area of 80,000 square meters, 150,000 TEUs ICDs for supporting containers, a 2,600 TEU container field, and 8,300 square meters of CFS warehouse.

1.3.2. Problems and obstacles

1. Water transported goods are subject to various extra costs such as double handling and time costs.

2. Access to most transport routes and networks for inland waterways is seasonal.

3. Four countries in the GMS zone (China, Thailand, Myanmar, and Lao PDR) are increasing navigation capacities by reef explosions in the Mekong River. This adversely affects the ecology of the Mekong River.

1.4. Air Freight Transport

1.4.1. Networks and nodes

Thailand currently has 35 airports and 31 air freight operators. The AOT, a state enterprise under the Ministry of Transport, is responsible for the continual development of international airports.

1.4.2. Problems and Obstacles

a. Four warehouses under the Airports Authority of Thailand have become highly congested. Moreover good must be inspected and pass the customs service process before loading on board, which is time consuming.

b. Thai airlines do not have air freighters, which increases freight costs.

c. Refrigerated storage or cool storage space is limited. Thus, exporting a large number of goods could be problematic.

1.5. Pipeline Transport

1.5.1. Networks and nodes

Thappline and FPT are two oil pipeline service providers. The usage of Thappline is approximately 32 percent while FPT provides services at about 36 percent of its capacity. The length of the natural gas pipeline is 1,359 km offshore and 1,031 km onshore.

1.5.2. Problems and limitations

Problem regarding pipeline transport is that the transmission percentage indicates under utilization, implying externalities to road users.

2. INFRASTRUCTURE DEVELOPMENT PLANS

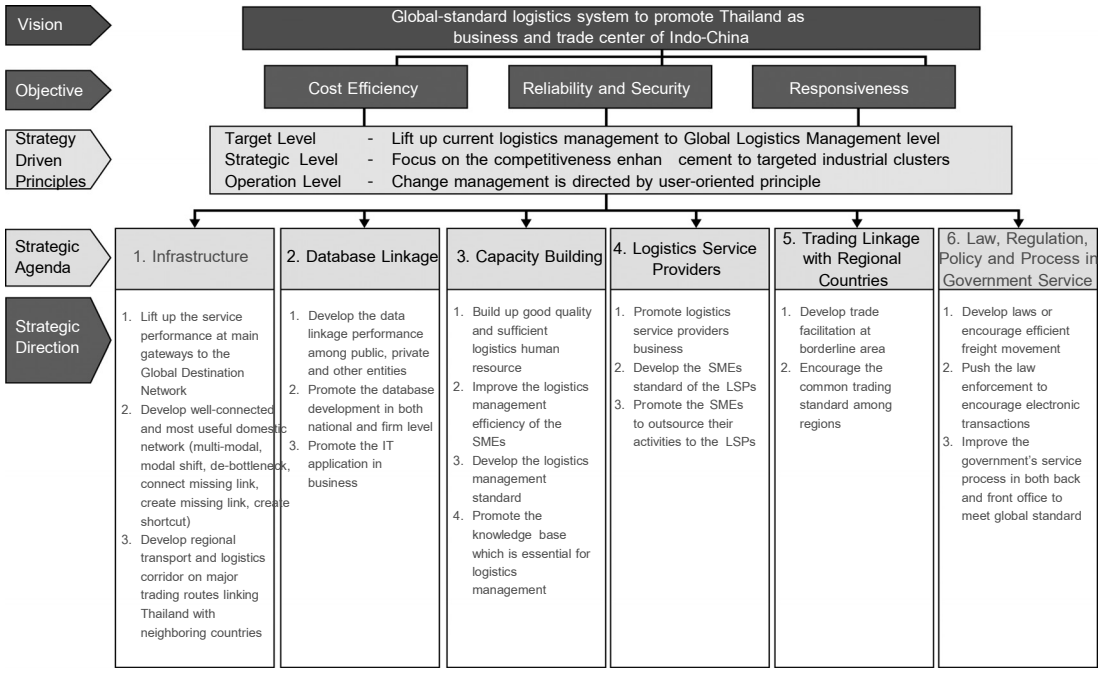
2.1. Approaches to Thailand's logistics system development

To develop the logistics system and obtain concrete results, collaboration is needed at all levels, including the government and private sectors, among other institutions. However, the extent to which the concept of the logistics system is understood varies among different sectors. Therefore, to promote the right concept and for the whole country to work toward a common goal, the Infrastructure Project Office, together with the Competitiveness Development Office and the National Economic and Social Development Board, as the government organizations tasked to enforce the national logistics development strategies, produced in May 2005 a document entitled "Thailand's Logistics Development." The document is designed to supplement "The

National Logistics System Development Master Plan." It also seeks to promote basic understanding of logistics and of the national strategies for logistics system development currently implemented by the government. It is aimed at all sectors, especially the private sector. It is hoped they will become widely active in logistics system development.

The approaches to Thailand's logistics system development covers infrastructure, data linkage and database development, personnel and knowledge base, service providers, regional trade linkage, and relevant legislation. The Ministry of Transport has made the Ministry of Transport strategic plan consistent with the logistics master plan by the National Economic and Social Development Board, as shown in Figure 2.

Figure 2: Framework of the Logistics System Development Master Plan



Source: NESDB. Logistics Master Plan during the period 2005-2008 (In Thai): 10.

2.1.1. Logistics Infrastructure

a. Development of major gateways

Laem Chabang Port

The Ministry of Transport has formulated water transport development policies to provide a low-cost transportation alternative that will help turn Laem Chabang into one of the world's top 10 ports.

International Airport

The Ministry of Transport has devised a strategy to develop aerial logistics, which focuses on developing Chiang Mai and Phuket airports as regional gateways, and the Suvarnabhumi Airport as a global gateway.

Border Checkpoints

The major problem confronting these checkpoints is the time-consuming border procedures. Solutions to quicken the process such as issuing permit papers and examining cargos are necessary.

b. Development of domestic transport linkages for continuous, convenient and safe domestic transportation

The approach aims at creating a shift from road-based transportation to transportation by rail and water, especially for the transport of goods in great quantities or over long distances. There has been a development approach employing hub-and-spoke management. However, construction of recent hubs has not been successful because it failed to consider the commodity flow rate in certain areas and also lacked efficient management. As a result, hubs turned out to be a cost-increasing burden and a waste of time.

c. Development of an international transport linkage for transport connection with neighboring countries

To realize its vision of transforming Thailand into a "logistics Hub of Indochina," the Thai government may consider establishing international allies or carrying out negotiations on overseas transportation with its neighboring countries.

2.1.2. Data Linkage System and Database Development

To establish a logistics database, a number of information studies have been conducted, covering both the demand and supply side (i.e., processing and providing information according to demand).

2.1.3. Personnel and Knowledge Base Development

The Ministry of Commerce and the Thai National Shippers' Council has created the *Strategy Map: National Capacity Building on Logistics 2005-2009*, which is organized around four perspectives: logistics strategy, learners, process, and learning and development.

2.1.4. Logistics Service Providers Development

Focusing on small and medium-sized logistic service providers, the main approaches seek to prevent price-cutting and capacity-building.

2.1.5. Regional Trade Linkage

International collaboration is crucial if Thailand is to become the gateway of Indochina. Essential approaches include alliance building, preparation for global changes and development in laws, regulations, and policies to promote trade and linkage of logistics system with neighboring countries.

2.1.6. Development of Laws Related to Thailand's Logistics System

Thailand's legal issues concerning logistics system need to be developed, revised, and updated. Effective enforcement is also crucial. The Ministry of Transport Operation

Plans and Projects has an urgent plan for logistics system development, which expects to decrease the ratio of the logistics costs to the GDP as well as shorten the operation time for both importers and exporters.

2.2. Future Plans

2.2.1. Future Plans for Road Infrastructure

Roadways. The Department of Highways is the main agency responsible for improvement of the national roadway network. Currently, 13 motorways projects, for a total of 4,150 km, are being constructed. They are to be completed in 2016.

Bangkok and Surrounding Area Express Roadway Project. The Expressway and Rapid Transit Authority of Thailand is currently undertaking a total of five projects to support the growth of traffic in Bangkok and surrounding area.

Four-Lane Highway Widening Project. This project aims to improve the state highway route, which connects Bangkok and other important provinces. The project costs 103,300 million baht.

Roadway Network Connection with Neighboring Countries. To connect the country's internal roadway network with those of neighboring counties and to promote Thailand as the center of provincial land transport, the Department of Highways' development plan includes:

a. Highway Development among Countries in Greater Mekong Sub-region Cooperation (GMS Cooperation)
b. ASEAN Highway Network development. And
c. ASIAN Highway Network

2.2.2. Future Plan for Railways

The State Railway of Thailand has prepared the following infrastructure development projects:

a. National double-track partial construction. The State Railway of Thailand has prepared the Track-doubling Master Plan for the construction of double tracks rails lines, initially focusing such construction in congested areas.

b. Double-track construction for East Coast Railway. The objective of the project is to increase the capacity and the efficiency of the east coast railway in order to support the growth of commodity transport, especially from the expansion of the Laem Chabang port. The project consists of two sections—the Chachoengsao-Sriracha-Laem Chabang and Chachoengsao-Khlong Sibkao-Kang Koi, which are expected to be completed by 2010 and 2012, respectively.

c. Double-track construction for Maptabao-Pakchong-Nakhonratchasima route and realignment. Currently, the SRT is preparing the project's terms of reference. The project covers the period 2009-2014.

d. Railway Maintenance Phases 4, 5, and 6. Phases 1 to 3 have been completed. When phases 4 to 6 are completed, the tracks will be able to support trains at a maximum speed of 160 km per hour.

e. Supplementary equipment: five locomotives and 125 container bogies. The objective of the project is to increase the efficiency of rail freight transport and promote rail transport as an alternative mode of transportation.

2.2.3. Future Plan for Waterways

The use of waterway transport has thus been promoted to utilize the existing natural infrastructure.

2.2.4. Future Plan for Coastal Transport

The Pak Bara deep sea port development is currently at the survey/design and project feasibility study stage. The improvement of Kan Trang port is expected to be finished by August 2008.

2.2.5. Future Plan for Air Transport

Government projects for the development of air transport are the Suvarnabhumi Airport construction project and the improvement of the Chiang Mai and Phuket airports, envisioned to become provincial aviation centers.

2.2.6. Future Plan for Pipelines

Two pipeline transport expansion projects; the North Region Network and North-Eastern Region Network are under studied The third Master Plan of Natural Gas Pipeline System 2001-2011 has been approved; thus, the network of pipelines for natural gas transport will be expanded. It is also possible that energy transport be expanded among GMS countries.

3. IMPORTANT ISSUES IN INFRASTRUCTURE SECTOR IN THAILAND

There are three important issues in the transport infrastructure sector in Thailand, namely, modal shift and intermodal transport issue; cross boarder transport agreement for market integration; and pricing for the infrastructure issues. We describe these issues as follows.

3.1. Modal Shift and Intermodal Transport Issue

As earlier mentioned, Thailand's freight transport is dominated by road transport. This mode is beset by problems like pollution and congestion, which are not adequately handled. The Thai government has tried to enforce the policy to shift the road transport to more efficient and environmental-friendly modes, namely, railway and waterway.

A modal shift occurs when one mode has a comparative advantage in a similar market or route over another. Comparative advantages can take various forms, such as better services, innovative products, costs, capacity, time, flexibility or reliability.

A modal shift from road to rail could thus be achieved if the State Railway of Thailand (SRT) offers to the customers comparative advantages over competing modes of transport that are significant enough to influence the key players (e.g., shippers, freight forwarders, shipping companies, etc.) in their transport mode decision. However, before such competitive advantages can be identified or generated, the railway sector as a whole has to be revitalized so that a series of legal, institutional, organizational, and infrastructural prerequisites are fulfilled and SRT is faced with similar conditions as competing modes.

For a modal shift to occur, the following prerequisites have to be fulfilled:

a. Broadening the focus of SRT (logistics strategy).
b. Implementation of logistics strategy (Concept for SRT logistics).
c. Proper legal and institutional framework for SRT.
d. Infrastructure development.

Intermodality is extremely vital to developing competitive alternatives to road transport. Relevant institutions need to build intermodal transport chains to combine the advantages of road transport (e.g., geographic coverage, flexibility, small loads etc.), which are particularly suited to pick-up and final delivery, with those of the alternatives modes (cost reduction through consolidation, accessible capacity, energy diversification, safety) for the main haul.

Due to restrictions of the railway as a transport mode in door-to-door services, the needed measures focus not only on accomplishing the legal, institutional and organizational prerequisites for a modal shift but also on the linking up of the various transport modes. There can be no significant modal shift without intermodality.

3.2. Cross-Border Transport Agreement for Market Integration

An important development of the GMS[1] market integration in recent years is the GMS Cross Border Transport Agreement (CBTA). This is in line with the ADB program to develop the economics corridors. Although the Agreement was ratified in 2003, all protocols were only signed in mid-2007. Furthermore, the implementation of this Agreement progresses slowly, and many barriers exist (Vienna Consult and TDRI, 2006). Still, logistics improvement via the cross-border transport feasible. The Agreement should be a concrete starting point for study from which policy recommendation for better integration of the GMS economy can be derived.

GMS integration is enhanced by the trade flow activity, especially cross-border trade. There are many examples pointing to the importance of cross-border trade as the key to better integration, such as the European Single Market program and NAFTA. By studying the NAFTA and Canada-US Free Trade Agreement, Woudsma (1999) pointed out that understanding freight flows is critical to all trade initiatives, because the increasingly competitive nature of trucking industry requires a close examination from the government. The changing spatial pattern of transportation flows is critical to issues related to safety, environment, and the supply and maintenance of infrastructure. Lastly, both the NAFTA and FTA explicitly include provisions directly related to the harmonization of freight transportation regulations in North America. In Europe, in its task to create a Single Market, the European Union (EU) adopted a series of measures aimed at liberalizing road freight transport and harmonizes conditions to allow for a level playing field in the market. Boylaud and Nicoletti (2001) pointed out that, in EU, there was an increase in cross-border traffic once trade barriers affecting road freight were removed, but the specific impact of road freight liberalization is more difficult to gauge as it is recent and was introduced against the background of the creation of the Single Market. However, trade and transportation are closely related. Improvement of transportation facilities should increase cross-border trade.

[1] The Greater Mekong Sub-region (GMS) comprises Cambodia, Lao PDR, Myanmar, Thailand, Vietnam, and the Yunnan Province of China.

To efficiently facilitate the market integration in the GMS, the CBTA is an important step stone to fulfilling the objective of market integration. However, the process of the implementation of the CBTA is rather slow, due to many reasons.

First, the impact of the implementation of the CBTA is unclear. The main ambiguity can be identified in many aspects, ranging from economic impacts (such as effects of commodities sales in the area), social impacts (such as migrant labor and social security), to environmental problems caused by the cross-border traffic. This makes the process slow as each member has no clear idea of the benefits, how to cope with the impact, and how to convey to the public the advantage and disadvantage of the CBTA. Lack of clarity on benefit sharing from the CBTA is clearly a significant problem.

Second, the improvement in transport infrastructure should reduce transport and logistics costs. However, the unclear implementation plan of the CBTA means that logistics providers have difficulty evaluating the benefit of the scheme. A study by Vienna Consult and TDRI (2006) quoted many shippers' statements on the unclear implementation plan of the CBTA that:

a. Although Thailand has signed the CBTA, it still does not seem to have a program to implement it in a coordinated way.

b. The challenge to the GMS governments is management and coordination of their many agencies.

c. The shippers and transport operators do not need subsidies and protection from the government. They need a clear transport policy so they know what to do and how to earn money.

Benefit distribution is still another important issue. The question is whether the benefit will be allocated to specific groups of importer/exporter.

Third, the issue of different transport regulations must be addressed. Each vehicle that travels through countries needs to comply with regulations of the host country. These regulations include driving license, vehicle standard (dimension, weight, axels load etc.). A common standard is needed for various national transportation systems. ESCAP

(2003) address an important issue of how such technical standardization can be applied in a realistic manner to a particular land transport route.

These are general observations of barriers that need to be explicitly addressed so the implementation of the CBTA can be successful. Furthermore, some specific issues should also be addressed.

Following is a list of four specific issues confronting the CBTA:
Transit traffic. First, Article 8 of the CBTA states that transit traffic shall be exempt from any custom duties and taxes and charges levied on transit traffic shall only be cost related. In theory, the charge on the transit traffic should reflect a true cost (both economic and social) that the transit traffic created. It should include not only the road construction and maintenance, but also environmental, costs. Moreover, infrastructure charging should not apply only to the transit traffic but also to domestic traffic, as most vehicles are not paying for the infrastructure they use via the annual vehicle taxation system in the host country. This is a complicated matter but has to be considered in the future as market-oriented integration in the GMS proceeds. (This is discussed further in the section on exchange of commercial traffic rights.)

Exchange of commercial traffic rights. This issue relates to Article 19 on the traffic right. It states that the operators (of GMS origins) have rights of transit through, inbound, and outbound operations. However, cabotage (or transport within a country) shall only be permitted on the basis of a special authorization from the host country. At this point, the intention of the agreement is to create a free market system, but this will be difficult in practice because the capabilities of operators in each country are different. It might be the case that operators in more advanced countries will dominate the market and leave no room for small operators from less developed countries. Although the Article 23 suggested a quota system according to the National Transport Facilitation Committee of each contracting party, the practical implementation plan has not yet been formalized. Furthermore, the pricing condition of transport is an important issue. According to Article 24, price setting for cross-border transport will be free and determined by market forces, but subject to antitrust restrictions and supervision of the

Joint Committee so as to avoid excessively high or low pricing. This leaves a big responsibility for the Joint Committee to monitor and control the cross-border transport operations.

Vehicle importation and infrastructure standard. The regulation of road vehicles and infrastructure capacity should be clearly identified in each country. Although the ideal system is that the GMS countries will use the same standard of vehicles and infrastructure systems, it is almost impossible to do so. Where vehicles are concerned, two considerations are important, namely, technical requirements and temporary importation of motor vehicles. In terms of vehicle requirements, the applicable standards of home and host countries should be compatible, such as safety standards and weights, axle loads and dimensions. Ideally, the harmonization of vehicle specifications should be encouraged. But it seems impossible in practice. This issue will be a key question to the harmonization of the system or minimizing the impacts of different regulations.

Institutional framework. The institutional framework is set in Part VIII of the In the CBTA. The Agreement identifies two committees: National Transport Facilitation Committees and Joint Committee. Both the National Transport Facilitation Committees and Joint Committees still need to define their concrete responsibilities and operations. They should act as regulators that enhance the cross-border transport.

These various barriers to the effective implementation of the CBTA need to be dealt with in order to bring about efficient logistics that will further promote growth and poverty reduction within the GMS region. These will be the focus of research in this project.

3.3. Infrastructure Pricing

Economic theory suggests that infrastructure charges should reflect the social marginal cost of adding an extra vehicle kilometer to the existing use of a road. This implies calculating and charging for the additional cost imposed on society

with regard to road maintenance, accident risks, congestion, and damage to human health and the environment from exhaust emissions and noise (Kageson 2003).

In Thailand, the charging for infrastructure is not consistent. Moreover, with the GMS-cross border activity in mind, the systematic approach to infrastructure charging is certainly required, especially for the heavy goods vehicles. However, it is very difficult to develop a charging scheme. Even the EU countries have a wide variety of the Heavy Goods Vehicles (HGV) charging systems. Sundberg and Cunningham (2002) summarize the levy charges for HGV use across the EU and Scandinavian nations into six schemes: Eurovignette, Vehicle Tax, Fuel Price, Fuel Duty, Road Tolls, and Other User Charges.

Of these measures, Eurovignette and Vehicle Tax are of interest. The former was established by the Benelux countries, Denmark, and Germany in 1995; Sweden joined the system in 1998. The idea wa that through the Eurovignette, participating countries would receive financial compensation for the wear and tear caused by HGVs, using their road networks. In each of the participating countries all vehicles with a gross vehicle weight in excess of 12 tons are liable for the charge. The Eurovignette directive (EU 1996) aimed to soften the impact of competition on the road freight sector caused by the existence of vastly different methods and levels of charging for the infrastructure use in different countries.

A study to aid the harmonization of the heavy goods vehicles charge by Nash et al. (2003) compared the charging systems of the heavy good vehicles across EU countries. In this regard they listed the following characteristics that were relevant to the study:

a. Roads to which the charges is applied to
b. Lorry weight charged
c. Vehicles charged (domestic and/or foreign)
d. Cost categories included in calculation
e. Type of charge (time or distance based)

f. Factors by which charge rates are varied

g. Revenue use

h. Other policies alongside tolls to ease implementation

i. Technical implementation and collection of billing data

This is an important issue that deserves further investigation. Although it is too early to do a design based on the charging scheme, the above list nonetheless provides an overview of the characteristics that should be taken into account when implementing such a charge. Furthermore, this list will be very valuable when the benefit sharing options for the cross-border transport movement in the GMS are analyzed in the future.

4. POLICY RECOMMENDATIONS

The policy recommendations for the infrastructure sector in Thailand involved three major issues: infrastructure, laws and regulations, and supportive measures.

4.1. Developing a policy document

In developing the infrastructure, one needs to consider not only how to construct the infrastructure per se, but also how to utilize the existing infrastructure and identify and prioritize the infrastructure development plan in the future. A report by Thammasat University [2] suggested that the government prepare a White Paper outlining infrastructure development strategies for transport sector. The White Paper should provide long-term objectives, targets, strategies, and developments plans, including infrastructure project planning for the next 15 years. It should aim to prepare the investment plan and address vital issues such as management, human resource, technology, and environment.

[2] Thammasat University (2004) The Study of Infrastructure Development Strategy to Support the Country's Competitiveness: Transportation Sector, report to the National Economic and Social Development Broad, December 2004.

In fact, the Ministry of Transport has produced a White Paper called "Transport for Thailand's Sustainable Development" in June 2007[3]. This White Paper revealed its vision as 'To develop the country's transport systems with higher quality and efficiency in service deliveries for a good quality of life, and sustainability for the country'.

To fulfill this vision, the White Paper identified seven development guidelines—Transport for Economic Development, Transport for Society, Transport for Energy Saving and Environmental Protection, Transport for Area and Urban Development, Transport for Links to Neighbouring Countries, Good Governance in Transport, and Human Resources Development for Transport. The objectives of these guidelines are as follows:

a. Ensure sound quality in transport routes and vehicles with a view to making them safe, convenient, and responsive to the people's needs.

b. Promote the development of transport modes that support livability, sustainable communities (which are convenient, clean, safe, systematic, etc.)

c. Promote public transport to provide alternatives to cars in urban areas

d. Create a transport network with a high level of multi-modal integration

e. Make existing transport network work more efficiently in a more environmental-friendly way

f. Stimulate and attract more investments in both production and service sectors in the regions

g. Provide greater opportunity for private sector participation in the development of transport systems

h. Develop human resources and management systems to enhance quality and efficiency in transport systems

However, the White Paper is just a starting point for the formulation of a long-term policy through a policy document. Pursuing a long-term planning is still needed. Coming up with a White Paper should apply to each strategic sector: road, railway, Aviation, and waterway and shipping. Therefore, the Thai Government should produce

[3] Ministry of Transport (2007) Transport for Thailand's Sustainable Development, June 2007.

such policy documents in order to provide both public and private stakeholders the guideline for the development of the transport sectors in the future.

4.2. Transport Infrastructure Development

There are seven important components in infrastructure development strategies in transportation, which are

a. To construct inter-city motorways for the north-south and the east-west corridor,
b. To construct a high-speed train system whose minimum speed is at least than 200 km/hr to meet the future demand of commercial passenger transportation. Add to this the need to construct double-track in various corridors and to restructure the organization of the state railways of Thailand based on a transportation reform. Lastly, there should also be efforts to lend support to members of the private sector that wants to be transport operators while keeping the safety regulations and maintenance under government control.
c. To develop sea motorways to meet the demands of freight transportation between the East coast, the South and the area around Chao Pra Ya River; to avoid land transportation through Bangkok and vicinities,
d. To develop deep sea ports, coastal ports, and river ports so that they could cope with a skyrocketing demand of water transportation in the future,
e. To develop international and regional airports so that they could meet the future demand of air freight and passengers which tends to be rising,
f. To build logistics centers in important border points, among others, along the north-south corridor, the east-west corridor and at intersections of main transporting routes. These are to be used as a hub for collecting and distributing goods to different part of the country and neighboring countries,
g. To construct transportation center for passenger transportation so as to promote public transportation.

4.3. Law, regulations, and rules

The law necessitates action. For example, it states that the office of transport and traffic policy and planning, which is under the umbrella of the ministry of transportation, is responsible for laying down the country's transportation policy. The appointment of a transportation policy commission whose representatives are from both the government and private sectors. It also specifies that an independent organization be set up to regulate transportation in economic aspects and defines its roles and qualifications of a commission. It requires that regulating authorities be established in different modes of transportation and that SoE Co. be organized in accordance with the guidelines of state enterprises reform. This is similar to the State Railways of Thailand's proposal to restructure the organization by establishing the SRT operation Co. SRT Rolling Stock, and the SRT assets management Co.

A discussion among ASEAN countries is likewise in order. It aims at improving the cooperative framework on facilitating freight transportation across borders and rules concerning height, width, length and weight of trucks- especially to increase the maximum weight of three-axle truck (10-wheels) to 10 tones.

4.4. Enhancing the regional integration through cross-border transport

Deeper and broader integration with neighboring countries in the region and beyond would enable the GMS countries to have better access to markets for their products as well as capital and technology necessary and appropriate for their further development. Through market integration, GMS countries would also be able to allocate and utilize their resources more efficiently. They would have even greater development opportunities through dynamic effects of regional market integration.

However, the development impact of regional integration may not be fully realized should the transaction cost of trade between and among member countries remains so high that the gains from trade are at best minimal. Transport and logistics cost is known to be a major component of transaction cost. In the GMS countries, transport infrastructure and logistics facilities and services are mostly under developed and hence remain a major obstacle to market oriented integration in the region. It has been argued

that reducing the cost and improving the quality of logistics and transport systems improve international market access and lead to increasing trade and investment and hence higher income and greater scope for poverty reduction (Carruther et al.,2003).

As the Asian Development Bank (2004) has stated, improving GMS connectivity will not only increase the volume of trade but also affect the pattern of trade in a way that increases gains. Improvements in roads reduce transport costs and also encourage interregional trade. This enhances the competitiveness of GMS members. Investments in connectivity have large impacts on poverty reduction by generating income and employment. By linking poor, remote villages to markets, such roads can also help reduce non-income poverty through access to health and education services (ADB, 2004). However, ADB also stated that a key characteristic of transport investments, especially road investments, to date is that they tend to be developed from national rather than regional perspectives, with corresponding difficulties in maximizing the benefits and opportunities from regional corridors. The challenge here is to develop mechanisms that allow for regional perspectives and the quantitative assessment and distribution of benefits and costs to be built into projects from inception (ADB, 2004). Although ADB is the major player in initiating the Cross-border Trade Agreement (CBTA), the implementation of this agreement needs cooperation from each GMS member.

To reduce the cross-border trade barriers, a number of policy scenarios on logistic cost reduction should be examined. One of these is the software measures to facilitate the cross-border economic activities. These measures include the distribution of costs and benefit of the infrastructure improvement project among the various countries. ADB (1999) pointed out that project costs and benefits are not equally distributed among the member countries. An example is the Kunming to Chiang Rai Road Improvements, where most of the benefits are expected to accrue to Yunnan Province and Thailand, but major investments will be required in environmentally and socially sensitive areas of the Lao PDR. Another example involves the East West Economic Corridor (EWEC). Nemoto and Kaji (2002) said that the present bottlenecks occur at the river crossing of Mekong River between Mukdahan and Savannakhet, and at National Route 9 consisting

of an approximate 200-kilometer road link from Savannakhet to the Viet Nam border. They raised the issue of how the National Route 9 can be operated and maintained. Clearly, maintenance costs should be charged to whoever is responsible for traffic passing through this route. However, a systematic approach of infrastructure charging is needed to share the costs and benefits of this logistics improvement.

4.5. Supplementary measures

Drawing up public service obligation contract. It is to be used as a principle and conditions for giving compensation to operators that incur losses such as a third-class passenger transportation operated by the State Railway of Thailand and non-air conditioned passenger buses provided by Bangkok Mass Transit Authority.

Accelerating the creation Public Services Agreement (PSA). The PSA is an agreement between a commission of budget policy and a minister whose annual budget is tied with governmental organizations or state enterprises. By so doing, the public services will be achieved. Cooperate governance, including accountability, transparency and the disclosure of output/outcome to the public will all be promoted.

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Chapter 10: Indo-ASEAN Logistics Network

Daisuke Matsushima

1. INTRODUCTION

Indo-ASEAN is a significant axis for East Asia Economic Integration. Currently, however, the relation is not strong enough in terms of trade and intra-investment compared to other axes such as Japan-ASEAN and China-ASEAN. Indo-ASEAN is in fact one of the weakest axis for East Asia Economic Integration.

Trade volume between ASEAN 10 and Japan, China, and Korea is 14 times larger then Indo-ASEAN's. Also, the trade volume between the whole of the ASEAN with Australia and New Zealand is 1.6 times higher than Indo-ASEAN's[1].

ASEAN Statistics

ASEAN trade by selected partner country/region, 2006

as of 15 August 2007

value in US$ million; share in percent

Partner country/region	Value			Share to total ASEAN trade		
	Exports	Imports	Total trade	Exports	Imports	Total trade
ASEAN	189,176.8	163,594.5	352,771.4	25.2	25.0	25.1
Japan	81,284.9	80,495.6	161,780.5	10.8	12.3	11.5
China	65,010.3	74,950.9	139,961.2	8.7	11.5	10.0
Republic of Korea	25,670.0	26,849.7	52,519.6	3.4	4.1	3.7
Australia	23,148.5	13,262.8	36,411.4	3.1	2.0	2.6
India	18,928.1	9,774.6	28,702.7	2.5	1.5	2.0

Source: ASEAN Trade Database (compiled from data submission and/or websites of ASEAN Member Countries' national statistical offices and other relevant government agencies)

Indo-ASEAN is connected with each other through a contiguous national border between India and Myanmar, and experienced considerable cultural and commercial exchange in the past. Yet, their countries seem to make little progress toward their economic integration. In some cases, this glacial pace may become one of the most serious bottlenecks to East Asian economic integration in the future.

[1] IMF International Trade Statistics and ASEAN Trade Statistics Database. This shows export amount. Figure of ASEAN 10 rely on ASEAN Trade Statistics Database, not including exports from Lao PDR or Vietnam.

1.1. Possibility of Japanese FDI activities

In this situation, we need to ask, who can strengthen the relations between India and ASEAN?

The answer comes from Japanese foreign direct investment (FDI) investors who have already spread a huge production network among East Asian economies in a "*de-facto* way". Their vast experience and knowledge can contribute considerably in bringing about the East Asian economic integration.

ASEAN Statistics

Top ten sources of ASEAN foreign direct investments inflow

as of 13 August 2007

value in US$ million; share in perc

Country[1/]	Value				Share to total inflow			
	2004	2005	2006	2002-2006	2004	2005	2006	2002-2006
European Union (EU)-25	10,046.1	11,139.6	13,361.9	44,955.6	28.6	27.1	25.5	26.3
Japan	5,732.1	7,234.8	10,803.3	30,813.7	16.3	17.6	20.6	18.0
ASEAN	2,803.7	3,765.1	6,242.1	19,377.7	8.0	9.2	11.9	11.3
USA	5,232.4	3,010.6	3,864.9	13,736.1	14.9	7.3	7.4	8.0
Other Central & South America[2/]	(60.5)	919.4	1,035.1	3,958.3	(0.2)	2.2	2.0	2.3
Hong Kong	529.6	773.0	1,353.4	3,430.7	1.5	1.9	2.6	2.0
Republic of Korea	806.4	577.7	1,099.1	3,347.3	2.3	1.4	2.1	2.0
Cayman Island	2,029.1	(19.9)	476.4	3,003.7	5.8	(0.0)	0.9	1.8
Taiwan, Province of Taiwan	366.8	(66.8)	668.1	2,417.4	1.0	(0.2)	1.3	1.4
China	731.5	502.1	936.9	2,302.9	2.1	1.2	1.8	1.3
Total top ten sources	28,217.1	27,835.4	39,841.2	127,343.3	80.4	67.8	76.1	74.5
Total	35,117.2	41,067.8	52,379.5	170,821.9	100.0	100.0	100.0	100.0

Source: ASEAN Trade Database (compiled from data submission and/or websites of ASEAN Member national statistical offices and other relevant government

- not available as of publication
x not available/not
n.a. not

1/ identified based on cumulative FDI inflow from
2/ includes countries in Central and South America, other than Mexico and
3/ includes inflow from all other countries, as well as total reinvested Philippines (local banks only) for 2001-2005 and intercompany loans in Singapore Ranking is based only on countries where data is

However, this paper cannot find any exclusive data on Japanese FDIs that indicates the origin of each capital. We cannot show any specific table that can identify how much of the capital comes from where or emanates from domestic capital. We can surely say though that Japanese companies have already contributed to the Thai economy substantially. In any case, we cannot explain the trend in the ASEAN industries without studying the Japanese manufacturing FDI situations.

In January 2006, around 1,251 Japanese firms participated in the Foreign Chamber of

Commerce, the highest among other participant countries (Second highest contribution came from Taiwan, which was double the US contribution). Based on a research of the Japanese Chamber of Commerce, more than 6,226 companies have already invested in Thailand.

In terms of generating employment opportunities, Japanese FDI companies have already provided employment to more than one-fifth, or at least one-sixth, of the 6.74 million members in Thailand's manufacturing sector.

All these underscore why we need to study the direction of Japanese FDI companies: This to so we can estimate the requirements essential in bringing about East Asia economic integration.

1.2. Logistics reform for reducing transaction costs

Reducing the transaction cost is essential in promoting economic exchange within East Asia. The only way to make this suggestion possible is through effective policymaking. Two constraints behind high transaction costs are *physical* and *institutional*. The former arises due to poor infrastructure/logistics while the latter is due to high tariffs. High tariffs are reviewed and monitored by free trade agreements (FTA) or Economic Partnership Agreements (EPA) or World Trade Organization (WTO) schemes. What needs due attention is the poor logistics situation. Nonetheless, these two constraints should be considered in tandem, like two wheels of a vehicle: Deceleration of one will hamper the other's speed.

The FTA/EPA has already reached the negotiation stage. On the other hand, strong policy recommendations for improving the logistics situation are needed. After all, FTA/EPA negotiations for East Asian economic integration will be unsuccessful without any accompanying reduction in transaction costs, especially freight costs, which can be reduced only by governmental bodies' initiative to effect reforms in logistics. This point is reinforced when ASEAN member-leaders met in Manila, Philippines, in July 2007 and agreed to place logistics on top of their priority to-do list for the ASEAN economic

integration until 2015. Since the ASEAN integration is central to the promotion of the East Asia Economic integration, it follows that logistics should be one of the most significant priorities for East Asia Economic integration as well.

This study therefore attempts to suggest several logistic reforms for better East Asian economic integration. Among the suggestions are those pertaining to FDIs for the manufacturing sector, especially Japanese FDIs.

2. APPROACHES

In this study, policy recommendations were arrived at while taking into consideration three points of views, all of which reveal situations on the Indo-ASEAN logistics network: Views from FDI investors (*micro approach*), views from soft infrastructure development for enhancing logistics networks, and views from users on physical infrastructure.

2.1. Views from Respective FDI investors considered as Micro-Approach

While previous studies focused on macro-perspectives on transportation in the East Asia, it is about time to also consider the strategic views of FDI investors based in the manufacturing sector as these are the key users of the logistics network. Information from these group may be useful in helping FDI investors set up their own Supply Chain Management System.

2.2. Views from Soft Infrastructure Developments for enhancing logistics networks

In tandem with physical infrastructure (or hard infrastructure) development, issues surrounding the soft infrastructure, which includes custom clearance and transportation services, should also be looked into for solutions. This combination of hard and soft infrastructure comprises the logistics network.

Hence, in the future, “transportation,” which simply means bringing items from one

place to another, can be replaced with the word Logistics, which has more a strategic and literal meaning to it.

2.3. Views from Users for Planning the Physical Infrastructures

By conducting follow up surveys on specific routes of transportation, preparing quality assessment forms and interviewing FDI investors, it is possible to highlight the actual issues and problems surrounding logistics in East Asia.

User views are valuable as these are based on real business perspectives. Such can provide insights into how to construct a successful physical infrastructure between India and ASEAN. By looking into multiple aspects of logistics within this region, we can suggest effective policies to the leaders of member-countries in the East Asia Summit.

3. ACTUAL VOICES OF FDI INVESTORS

Listening to the views of FDI investors, the major stakeholders in East Asia, should be the first step. Interviews conducted by personnel under the Japan External Trade Organization's (JETRO) Logistics Network Map Project as well as from other interviews elsewhere, uncovered several issues that can be improved in the transportation or logistics network of the region. Sixty-eight Japanese FDI companies that set up businesses in the ASEAN and India were surveyed using the questionnaire (See Appendix A: Questionnaire of the Distributional Trend) in September 2007.

I. Obstacles in logistics network from India's side

The most serious problem surrounding trade and investment between India and ASEAN is the underdeveloped Indian domestic infrastructure, both the soft and hard types. In the following section, problems surrounding the Indian domestic infrastructure, which includes ports, railways and roads---considered as functional infrastructure of industries--- are identified.

3.1. Ports

The three major complaints identified with the Indian ports are:

1) Shortage of handling capacity
2) Lack of global standards in soft infrastructure (such as nontransparency, long custom procedures, etc.)
3) Lack of connectivity between ports and roads

3.1.1. Requirement for New Ports Development

India is now facing an absolute lack of capacity in ports. Those engaged in the manufacturing sector think that the over-concentration of containers in JNPT Port or Mumbai Port along the western coastal area will soon get out of control. A similar situation is happening to the Eastern coast (Chennai port) as well.

Because of these, the investors urge that the following two points should be taken into consideration when developing new ports:

Enlarging commercial ports. More than 15m deep ports will be required to accommodate jumbo container ships.

Improving basic port functions. Fundamental facilities such as gantry crane should be added to enhance the port's handling capacity.

3.1.2. Improvement of port operations

In addition to proposed improvements on the physical infrastructure, Japanese FDI investors also suggested enhancements in two aspects of port operation:

1) Improving Port Operators' skills

Some Japanese FDI investors complained of a 3-percent to 5-percent cargo deficit in the

handling process in Indian ports. Therefore, it is necessary to enhance the skill of port operators. To make this possible, capacity building programs or on-the-job training programs can help.

2) Speedy, simple, and transparent custom clearance procedure

Any effective transportation in ports cannot be realized without including user-friendly clearance procedures. Several Japanese FDI investors have complained that they wasted time in ports due to the long and tiring clearance procedures. Therefore, it is essential to introduce one standardized e-custom system that can help simplify, speed up, and allow transparency in custom clearance procedures.

This e-custom system will help prevent several informal/illegal activities such as bribery. It can be used to monitor criminal activities in the transportation sector without incurring any huge transaction costs. Moreover, it will help regional traders if Radio-frequency identification (RFID) tags and pre-custom clearance procedures be used in Indo-ASEAN trade. Moreover, it will be more beneficial if this RFID tag be adjusted to the ASEAN standards and requirements.

3.1.3. Establishing Multi-modal Connectivity

A multimodal connectivity with Indian ports is now eagerly awaited in tandem with the physical infrastructure development of the region. This multimodality can bring about enormous benefits for companies that play active parts in the Indo-ASEAN region.

ⅰ. Connectivity with Freight Railway

Constructing incoming lines that connect ports to main railways will allow travelers to shift to different modes of transportation easily.

ⅱ. Customizing Port Space

Car parks or dedicated berths are required for automobiles inside the Indian ports. Investors and companies who aired such requirement added that they need a parking

space that can accommodate at least 10,000 vehicles per month within the port area.

iii. Bring in more shipping companies in the line between India and ASEAN

The absolute lack of shipping forwarders to handle Indo-ASEAN trade is another serious problem. This, however, seems like a chicken-and-egg dilemma because if only the infrastructure is set up in this region, shipping companies will find more reason to relocate here.

3.2. Railways

Ever since the colonial times, Indian railways has had more potential than ASEAN railways. Today, the government of India also plans to construct one dedicated freight corridor, which is scheduled for completion by 2013. Once this railway project is finished, India will have its own dedicated freight railway line between Delhi and Mumbai, complete with high-speed and huge-capacity trains. Thus, in the future, Indian railways will have even greater capability for inland transportation.

In this case, investors, particularly cargo owners, want to make sure that such railways will be properly operated and maintained.

3.2.1. Satisfactory Railway Operation

Railway operation should also satisfy investors' needs in these three areas:

i. Introducing Market Mechanism in Railway Operations

After June 2006, freight railways were deregulated. Companies need to satisfy only a couple of conditions to receive entry into the freight railway business. However, more deregulatory rules are required for this industry to effect a truly "free-trade operation" system.

The tariff system should be also diversified and discounted, or at least should fit market

requirements when implemented[2].

In the future, FDI investors/cargo owners wish to see more user-friendly transportation services---e.g., flexible arrival and departure slots through forwarders, that will enable them to apply efficient supply chain strategies such as the "Just in Time" inventory system.

ii. Mixed Loading

The current container loading practice is uneconomical because such utilizes inseparable container service. Mixed-loading technique should become the more common alternative. In reality, however, forwarders would not agree to accommodate small lot items through mixed loading.

iii. Traceability

Traceability is another means of improving the transportation system as well as implementing better cost and time management. Example, trains are hard to track without a system such as the global positioning system (GPS). Should accidents occur to the transport, cargo owners would be at a loss regarding where to get information on the location and details of the accident. The GPS therefore should be a feature that must be added to railway trains.

The introduction of such sophisticated traceability system enhances transportation services. This has been found so useful that at certain cases, this seems to be one of the more priority areas than development of physical infrastructure.

[2] The Indian railways provide three tariff options only: less than 20 tons; 20-26 tons; and more than 26 tons. Therefore, if an auto company wants a car transported by train and if the car weighs less than 2-4 tons, this company is going to waste money. This is why freight cost of a train is more expensive than that of trucks. In fact, the Indian train freight cost seems to be three times higher than international rates.

3.2.2. Requirement for skilled railway workers

Similar to the sea ports, there is a need for skilled and better-coordinated operations workers. Therefore, the only way to achieve this is to focus on the capacity building of human resources in specific areas.

3.2.3. Bigger transport capacity through multi-modal connectivity

Railways should be connected with another mode of transportation. On this issue, below are some demands voiced by FDI investors:

- Incoming line toward each industrial park;
- Logistics hub with a huge amount of space next to the inland depot;
- Purchase plan for importers who can purchase items directly from bond warehouses;
- Reduced loading time from train to trucks.

3.3. Roads

Aside from the issues earlier raised, there are two main concerns with road infrastructure: (1) the absolute lack of road infrastructures; and (2) high transport costs due to the additional state boundary tax or *Octroi* as well as poor services of transportation companies that tend to service only specific locals area, not the whole of India. These concerns are the source of frustration of investors well as cargo owners.

II. Need for Indo-ASEAN multi-modal logistics network

Almost all FDI investors have sought out multiple alternatives for their transportation situation. The following multiple measures agreed between India and ASEAN can provide the needed strategic logistic network to the East Asian economic community.

3.4. Sea Routes: Making Portfolio for utilizing ports

In terms of port use, the presence of more alternative sea routes can help passengers and port users avoid disasters or artificial accident risks. This will also help to provide investors with multiple port options, when faced, say, with unfavorable weather or socio-political constraints in one area of the route.

In this regard, India should develop both the coastal lines in Arabian Sea and Bay of Bengal. The Bay of Bengal has the most potential as it can ensure sea connectivity between India and ASEAN. Special policies should accompany the development of the bay's coastal line, though.

3.5. The Air Routes for the Speedy and Safety Logistics

When it comes to the air travel, cost is the most sensitive factor. High-valued special parts are products most in need of this mode of transportation. Thus, the airport's capacity as well as the air navigation routes are important factors for users.

Companies utilize airfreight to save on time. When faced with dwindling inventories, businesses would not think of personally handling the end-to-end transit of these goods to their production sites. Their more efficient option is to use the airfreight system. This is the reason air customs clearance---not inland route clearance---is extremely important.

Relatedly, the timely arrival and departure of carriers is the lifeline of air travel. In practice, however, no such strict time control system has been developed and agreed between India and ASEAN, which means that India and ASEAN have yet to synchronize their clocks. Time control is essential in preventing severe airway accidents.

The first order of the day, therefore, is to establish a "standard clock"[3] in both business

[3] It is necessary to set up a "Standard Clock" when measuring the correct time. This "Standard Clock"

and social contexts. Standardizing the time will not only make a Just-in-Time type of supply chain management possible; it will also synchronize arrivals and departure in a multimodal transport system involving freight trains, trucks and ships.

From a different viewpoint, the improvement of passenger transportation should also be considered if a nation aims to development its manufacturing sector in this region. For example, Japanese FDI investors invite many maintenance technicians from Thailand from time to time. This type of mass transit is important in setting up a successful industrial network between India and ASEAN.

Note, however, that there is currently a lack of services trade data between India and ASEAN. Arrangement of services trade should be considered a top priority to enhance regional movement.

3.6. International Inland Connectivity

The ASEAN countries have started developing the East-West Economic Corridor across Vietnam, Thailand, and Myanmar. Extending this economic corridor further from Myanmar to India is one of the plans under the Asian Highway Project of the United Nations and Economic and Social Committee for Asia and Pacific (ESCAP). Such was launched as ALTID in 1992 and is expected to cover 141,000km and 92 countries.

It was on July 4 2005 when the multilateral agreement for an Asian Highway Project was endorsed by 20 member-countries, including India, China, Japan, as well as ASEAN countries. The agreement, however, faced its most serious hiccup with the nonparticipation of Bangladesh.

Under this agreement, each participant has to follow three rules:

- Endorse the Asian Highway Network Project's highway routes development
- Follow the Asian Highway standard or classification of traffic rules

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can cover 6,000km across area. Japan, the United States, European Union and China have already had done so to synchronize time in their regions. If we can build a "Standard Clock" in India, Brazil as well as Australia, such will synchronize time all over the world.

- Set up Asian Highway traffic symbols

This project will provide the possibility of another transport mode---the inland connectivity between India and ASEAN---but it also faces certain difficulties in construction. At presently, some investors doubt such will be a success. Currently, its implementation is in need of more multinational cooperation.

Keep in mind that the level of development of roads in ASEAN/South-East Asia and India or South Asia has a _____ gap of 16 percent of the whole Asian average. To step up its road development, its 26,000km priority routes alone would need an additional investment of about US$1.8 billion. Of this, India can provide financing mechanisms such as Public and Private Partnership (PPP) schemes as well as technique transfers, which can be co-joined with Japan or other countries.

This project also emphasizes on an inter-modal transport in connecting supply bases such as factories, to markets. Connecting sea routes with the Asian Highway is also regarded as an option.

Under the Asian Highway project, 121 priority projects have already been implemented. What is now needed is an assessment of these projects.

III. Transportation Quality all over the East Asia

Transportation should first be regarded as logistics if one were to ensure the quality in the transportation sector of East Asia. Transportation quality is in fact one of the most sensitive agenda in the business community.

To ensure such quality in India's transportation sector, it first has to overcome two major challenges: how to solicit institutional recognition from ASEAN as well as how to develop its human resources. For instance, adopting the advanced transportation strategies employed by ASEAN or Japan can help improve the transportation situation in India.

Elsewhere, a number of quality-focused initiatives have been implemented. Below are some of the transportation institutes established with Japanese assistance:

3.7. Manila Commercial Shipping University lead by a Japanese transportation company

This educational institute was established in 2007 with the purpose of educating middle-class ship handling officers. It provides education on such topics as practical navigation techniques, mathematics and cargo handling techniques, which are different from the regular curriculum of other universities. This training is in answer to the need for more skilled workers in the transportation field.

3.8. Haiphone Vietnam Commercial Shipping University headed by a logical company and in collaboration with a Japanese company

This school has been in operation for 50 years and has been producing more than 2,500 graduates every year. It ranks among the top 15 high-level schools in Vietnam. It provides not only navigation-related courses but IT and sea transportation management courses as well, which help produce specialists in these logistics fields.

India, too, has some good institutes but the educational structure is too pyramidal, which limits the number of high class students. This is why it is essential to bring its local institutes' standards up to global standards.

4. BEST PRACTICES

What are some of the Japanese logistics/transportation strategies that India can adopt? Some of Japan's business models in logistics explain a lot about how to develop both the hard and soft transportation infrastructure. However, it should be kept in mind that these best-practice models are based upon the current transportation situation. If this situation is changed, then it becomes necessary to change the models as well.

Following the example of the Japanese, some of the current best practices that can be adopted are:

4.1. Overcoming underdevelopment of India's domestic infrastructure by utilizing railways.

India's inland transportation is currently over 70-percent covered by trucks. However, there is valid reason to shift to railway transportation: To prevent the complicated procedures associated with travel taxation or value-added tax[4], which are now each imposed on every transporter.
On a per-industry basis, some of the requirements are:

4.1.1. Electronics & Electric Appliance

If high-quality service can be provided in railway transportation, then it brings with it two advantages: Shorter delivery time and reduced freight costs.

4.1.2. Capital Goods such as Manufacturing Machines

Transportation quality should apply across levels, i.e., such should not only apply to the transport of some small machinery, where it is already in effect, but to high-level precision machines as well.

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[4] In terms of value-added tax (VAT), the government of India has already announced that it should apply a uniform taxation system, including VAT, until 2010.

4.1.3. Iron and Steels

After 2013, when the dedicated freight corridor (DFC) will be completed between Delhi and Mumbai, delivery time will be reduced to two or three days and consequently, companies will prefer their deliveries to be handled via railway trains rather than trucks. Also, the recent hikes in crude oil prices will surely make train use more popular and economical than trucks.

However, for trains to be truly preferred by users, one condition is to make sure trains' freight capacity is increased by simply adding such vehicles' quantity. The dedicated double-decker trains, which can carry cars and iron and steel, should be considered as s way to expand freight capacity.

4.2. Utilizing some facilities for creating a multimodal transportation system

Around the Indian west coast, Mumbai's Jawaharlal Nehru Port (JNPT) is already facing excess capacity. Moreover, during the monsoon season, the port is susceptible to damage due to the harsh rain[5]. Thus, there is a need for a new port along the Bay of Bengal. The presence of a new port will also help reduce port tariffs[6].

In the southeast part of India, the Chennai port is one of the most crucial structures; unfortunately, this port has no potential for additional development because it exists in the center of Chennai City. The local government does have plans to develop new ports but it currently needs to make sure that this is consistent with the port development agenda for the whole of India.

Multiple port development activities should be comprehensive; i.e., this should include connectivity with railways, roads, and ports. For instance, in the northwestern part of India, the Delhi-Mumbai Industrial Corridor project has been launched, which should

[5] We require adequate port development under the DMIC project.

[6] One auto company has already changed port from Mumbai to Kandhra because of increasingly higher tariffs.

provide the area with a multimodal transportation system.

In terms of modal shifts, the strategic behaviors of each business should be taken into consideration. For example, airfreight is generally used for ensuring pilot supply to markets. Therefore, in accordance with the emerging markets in East Asia, each company should consider mixed sea-and-airfreight options as best practice.

4.3. For Transportation quality

Transportation seems to be regarded only as a cost by companies. It confounds many that so many firms would agree to pay for transportation. The reason is that there is a trade-off problem between reducing freight cost and achieving the quality in transportation service, including speed in delivery as well as deficit in cargo items.

Should one outsource transport of cargoes or handle it internally? This is the question. There are different practices followed by different companies:

4.3.1. Outsourcing Transportation Strategy

Many automobile giants try to impose their transportation cost on their levels. However, in reality, the cost of such distribution system from their levels gets transferred to the supplier's product cost center.

For some companies, outsourcing their transportation requirements is one way of reducing cost. Establishing their own logistics network is an outsourcing strategy. Some companies would set up their logistics base such as a hub-and-spork system all over India so as to access the diversifying Indian market.

In this case, the risks of each logistics base are transferred to each landowner. In this way, outsourcing is used as a way of avoiding risks in transportation.

4.3.2. Strategies for self-supply

In the region between India and ASEAN, where there exists an underdeveloped transportation infrastructure, instead of outsourcing, a company's strategy of taking on the task of handling the delivery and transport itself might be a better option for reducing logistics costs.

For instance, a forwarder company may now decide to provide its own trucks, which can be traced every 15 minutes through the GPS tracking systems as well as conduct training for its own truck drivers to enhance quality of the transport service. These trainings include lessons on safe driving, cargo sanitation and accurate delivery.

Both alternatives discussed here prove that there are options for surviving the premature Indo-ASEAN infrastructure situation. For now, however, these options seems be old ways of surviving in business and therefore need to be modified based on the developing infrastructure of this region.

Hence, depending upon the socio-economic environment, each company should decide its own efficient strategy for transportation, which literally means "logistics."

5. CONCLUSIONS AND POLICY RECOMMENDATIONS

There are three points that can be derived from this study on enhancing the Indo-ASEAN logistics network:

1) Strengthen Indian domestic physical transportation infrastructure;
2) Set up multi-modality for Indo-ASEAN logistics network;
3) Ensure transportation quality as value-added logistics.

The next section suggests several policy recommendations for how to solve the problems discussed in this paper, all with the purpose of promoting Indo-ASEAN economic integration.

The following policy recommendations for both India and ASEAN take into serious consideration the needs of Japanese FDI investors.

5.1. Special measures for developing domestic infrastructure in India

The government of India has already launched one of the biggest projects for enhancing domestic infrastructure, especially physical infrastructure, in collaboration with the Japanese government. This is the Delhi-Mumbai Industrial Corridor (DMIC) Project. With reforms in such areas as entry restrictions for FDI investors now in place, transportation services are also picking up. These situations can create a better climate for the logistics network in India.

The DMIC project covers not only the physical infrastructure development but soft infrastructure development as well, in one of the most significant parts of India: the section between Delhi and Mumbai.

5.1.1. DMIC Project

What is the DMIC project? Delhi, the official capital of India, has more than 13 million people while Mumbai, the "capital of commerce and finance in India" is home to over 16 million individuals. The DMIC project's infrastructure facilities will be located between Delhi and Mumbai, stretching 1,463km in length and 150kms in width. Here, the area will be converted into an attractive investment and industrial area of India. This idea of developing an industrial belt in India takes its cue from the Japanese Pacific Ocean Belt Area project, which concentrated several economic resources in the area between Tokyo and Osaka or Fukuoka, along the Pacific Ocean. This was in the 1960s, around the same time Japan got its so-called miracle economic growth of 10 percent per year.

By developing world-class physical infrastructure in the DMIC area, India will be able to attract several manufacturing FDI investors. Such industrial concentration in this area,

envisioned to be one of the largest production bases as well as an export base, is going to bring a huge economic boom, together with exports from India.

5.1.2. Goals for DMIC

In terms of the DMIC construction deadlines, Phase I is supposed to take five years (from 2008 to 2013) and phase II covers another five years (from 2013 to 2017). The Indian government has already announced ambitious targets:

- Generation of employment opportunities (15% annually)
- Industrial production (25% annually)
- Export (32% annually)

This way, India definitely aims to promote its manufacturing base in DMIC so as to provide employment opportunities as well as develop its export sector. In the project's concept paper, its government also plans to construct industrial infrastructure such as industrial parks, food processing industry hubs, and IT or IT-enabled services centers. Logistics hubs, which can establish an effective supply-chain such as multi-modal transportation connectivity, are among these. In this plan, the DMIC project will create a comprehensive transportation infrastructure, where facilities are combined: port, railway, road, and inland depot. New roads and railways should also be connected to existing routes.

5.2. Multi-modal transport system and logistics network

5.2.1. "East Asia Optical Infrastructure Development Vision"

To enhance the logistics network among ASEAN+6 countries, investors' development plans for East Asia should be brought to the public's attention. This vision to develop ports, optical navigation, or aviation routes can help stakeholders in East Asia to understand how valuable this region is in the future.

Getting each investing company to declare its clear future plans for infrastructure development in this region will not only help in setting a sustainable policy for East Asia. Such will also prevent duplication in investments and ensure a stable investment in this region.

All these plans on infrastructure, including a description of the current situation, will be included in a white paper. Japan External Trade Organization (JETRO), too, has already published the "ASEAN Logistics Network Map" and is currently working on the "India and Indo-ASEAN Logistics Network Map," which describes practical logistics behaviors of companies in this region as well as surveys specific routes used.

5.2.2. Export of PPP scheme for collaborated infrastructure development among the East Asia

In the process of developing the infrastructure in ASEAN+6, financing is the most challenging issue. India has already established PPP schemes and implemented these, specifically in the DMIC project. Therefore, "exporting this PPP scheme" from India effectively to other East Asian countries seems a good way of overcoming financing issues. Other countries, including Japan, should cooperate in this field.

5.2.3. Indo-ASEAN Collaboration for developing physical or hard infrastructure

To physically connect India to ASEAN, the physical infrastructure mentioned earlier, including the land, sea and air routes, should be placed at the top of the to-do list in the future.

ⅰ. The extension of East-West Economic Corridor under the Asian Highway Project

India, ASEAN as well as other members of ASEAN+6 countries should help in developing the Asian Highway project or Hanoi-Delhi Railway project under UN-ESCAP. Under this project, roads have been constructed in almost all the parts between India and ASEAN. However, it is also necessary to upgrade certain routes, such as expand the road width, especially between India and Myanmar. This project can provide trade opportunities among Indo-ASEAN nations once infrastructure for both

sea routes and air routes is in place. To extend the East-West Economic Corridor, the first step is to conduct a feasibility study on the Indo-Myanmar road routes.

ⅱ. "Commercialization of Bay of Bengal", CBB Project

As a sea route, the Bay of Bengal has the maximum potential for development with reference to utilizing the feeder ship network as well as port and optical sea routes between India and ASEAN. The infrastructure needed to commercialize the Bay of Bengal has to be in place if one were to effectively promote the Indo-ASEAN economic trade partnership. Unfortunately, such is hampered by currently unstable political conditions in the area.

In June 2004, countries along the coastal line of Bay of Bengal agreed with the BIMSTEC scheme[7] and started discussing possible FTA agreements that aim to promote trade and economic integration of this region. Unfortunately, this did not progress far either.

Today, some companies continue to call for the improvement in the shipping facilities between India and ASEAN. Again, special conferences or dialogues with experts will have to be called for such aim to become a reality.

ⅲ. Cooperation for Constructing "Standard Clock"

If Indo-ASEAN wishes to realize its dream for a world-class logistics network, it is essential that its countries synchronize their time with each other. This is one of the most important requirements for any Just-in-Time strategy and will contribute to making the logistics network more efficient and competitive.

To synchronize time, one standard clock is required. This is especially a necessity in the

[7] Under the framework of BIMSTEC FTA agreement, India, Sri Lank, Thailand will reduce the tariff as a first truck group, Bangladesh, Butarn, Maynmar as well as Nepal will follow this first group as normal truck group.

aviation system as there are nowadays numerous flights to and from India and ASEAN, and these flights are increasing each day. Synchronizing the time of airport control towers and pilots will contribute to safety in air travel.

To set up a standard clock, US$20 million to US$30 million is required. As this nonexclusive and noncompetitive service is for the public's interest, there should be a political will between the governments of India and ASEAN countries to see this through.

5.3. Measures for High Quality Transportation Services

5.3.1. The Creation of Conference body for the East Asian Logistics Networks

To enhance the quality of transportation services, drawing up its list of standards for the logistics industry to abide with is the top priority. In this sense, FDI investors or companies in Indo-ASEAN---or East Asia in general---should be willing to come to the discussion table. Two bodies needed are:

ⅰ. Cargo Owners Council

A Cargo Owners' Council in East Asia can provide the forums for discussing East Asian logistics network issues. This council should also become a permanent body that provides policymaking recommendations for the logistics industry. It should set the priorities in services, facilities and infrastructure development based on the program for East Asian economic integration.

ⅱ. Studies under the ASEAN Common Investment Climate Project

To generate discussions within this future Cargo Owners' Council, members need objective data from existing comparative studies on the East Asian logistics network. The ASEAN Common Investment Climate project of the ASEAN Secretariat Bureau has conducted an in-depth study on the investment climate of East Asia. This project's study should be extended to the logistics industry.

ⅲ. Indo-ASEAN Services trade Statistics Foundation Project

If Indo-ASEAN trade is to be enhanced, it is necessary to complete the services trade statistics on Indo-ASEAN. Estimating mass transit within the region can be a take-off point for many fruitful policy recommendations for East Asian economic integration. At this point, the services trade statistics, which presents a picture of the logistics activities, should be driven by the multilateral cooperation among the East Asian countries. Services trade is important to India because of it great profit potential compared to goods trade.

5.3.2. Standardizing, Bringing Transparency & simplifying Transportation Standards

When reviewing the quality of transport services, such services should be compared with each other with the aim of setting standards across all these areas.

ⅰ. "Transportation Service Tariff Table" Project

In this project, the tariff for each of the transportation services will play a significant role. Once details of this transportation service tariff table is announced to the public, it will be easier to enhance or standardize the system for transportation services via market mechanisms.

These relative views on all the transportation service costs can act as a kind of peer pressure against the groups who act based on vested interests and who perpetuate inefficiency in the transportation service sector.

ⅱ. Standardizing Transportation facilities

Standardizing the transportation facility in East Asia is among the most effective strategies. Examples of ways to do this is to standardize RFID tags in inventory tracking as well as custom clearance rules.

5.3.3. Capacity Building for Human Resource Development in the Transportation Field

ⅰ. Public-Private Cooperation for Logistics Educational Institute as Capacity Building Centers

In terms of human resources development, the public sector has to collaborate with the private sector, where there is a huge amount of knowledge and skills. The establishment of Indo-ASEAN Logistics College is one of the most symbolic projects in this context. Such educational institute should include three types of transportation specialists under the East Asian-specific standard: (1) Technicians for controlling or operating ports; (2) Technicians for operating trains, especially freight trains; and (3) Technicians for managing custom clearance or for operating warehouses.

ⅱ. Sharing Japanese experience in "modernizing the transportation sector"

Japan can help in capacity building by dispatching its transportation or logistics experts to India and ASEAN and helping to develop the basic structures of these areas' logistics network. This way, Indo-ASEAN will learn from Japan's experiences in modernizing the logistics network and on how to remove obstacles to an efficient transportation system.

Chapter 11: Build-Operate-Transfer for Infrastructure Development: Lessons from the Philippine Experience

Gilberto M. Llanto

1. INTRODUCTION

1.1. Economic growth, economic integration and infrastructure

The globalization of production and distribution has required countries to have efficient infrastructure in order to be able to have substantial participation in global trading and production networks. Inefficient infrastructure creates a bottleneck and impediment to trade and growth and thus, there is a drive to meet the infrastructure gap or to make more efficient existing infrastructure in many countries in East Asia. Studies have shown the important link between infrastructure and economic growth. Canning and Pedroni (2004) investigated the long run consequences of infrastructure provision on per capita income in a panel of countries over the period 1950-1992. Their results provide clear evidence that in the vast majority of cases infrastructure does induce long run growth effects although there is a great deal of variation in the results across individual countries. Summarizing the results of various estimates[1], Gramlich (1994) and Sturm and De Haan (1995) found output elasticities with respect to public capital of around 0.3. Wang (2002)'s estimates for seven East Asian countries for the period 1979-1998 indicated an average elasticity of 0.2% of private production to a 1% increase in public capital. On the other hand, there are still debates "about whether infrastructure provision actually fosters economic development or whether it is provided as a product of the economic development process (Button, 1998)[2].

Notwithstanding the lively debate among different researchers on the link between

[1] Other economists criticized that the estimated output elasticities were implausibly high. Sturm, Jacobs and Groote (1999) mentioned the criticisms made on Aaron (1990), Hulten and Schwab (1991) and Munnell (1992).

[2] Button (2002) notes the inconclusiveness of empirical evidence on this matter, citing problems with data and techniques that are used to provide empirical estimation on the relationship between infrastructure and economic growth.

infrastructure and growth, the preponderance of empirical evidence shows that inadequate supply of infrastructure or unreliability of infrastructure services may constrain investments of productive capital and lead to a restriction or reduction of output There are too many pieces of evidence supporting the significant impacts of infrastructure on productivity and growth that are difficult to ignore (Rodriguez, 2006).

In a recent empirical paper on whether or not infrastructure acts as a binding constraint to growth, Llanto (2008) pointed out the importance of infrastructure as a major driver for growth and poverty reduction. The lack of adequate transportation, water and energy facilities, for instance, can adversely affect the development of existing industries and may likewise preclude new entrants from coming in. An efficient transportation and communication infrastructure provides overall mobility for goods and people alike, contributes to a reduction of input and transactions costs and enhances the efficiency of markets. Local infrastructure which may have significant spillover effects spurs local economic activities while the network characteristics of infrastructure enhances connectivity of regions and promotes domestic integration. The key role of infrastructure in economic growth can not be ignored. It is well-known that East Asian countries with good infrastructure have good records of growth and poverty reduction.

Efficient infrastructure is important for economic integration in the ASEAN and East Asia and for narrowing development gaps. The new economic geography considers two forces that work on economic integration among countries as well as domestic regions within a country: (a) agglomeration forces and (b) dispersion forces. While agglomeration forces widen disparities among countries and within country, countervailing dispersion forces motivate the relocation of economic activities, e.g., manufacturing to lagging countries or regions as congestion in the more developed countries or regions within country starts to constrain further growth.

The Interim Report of ERIA on "Developing a Roadmap toward East Asian Economic Integration" draws attention to a sign of congestion in economic agglomeration in East

Asia, and the dispersion forces start working so as to influence industrial location[3]. Congestion and increases in production costs, e.g., high wages, difficulty in securing land, suggest that dispersion forces come in to address these constraints. The Report notes that firms have to find labor from far distance, and some of them eventually set up a new factory in a middle-size city or in a rural area. The Report cites fragmentation theory to explain that differences in location advantages such as factor prices motivate fragmentation of production processes. Differences in wage levels between ASEAN forerunner countries and Cambodia, Laos, Myanmar and Vietnam (CLMV) are still substantial, and thus, CLMV may rather have strengths, particularly for labor-intensive or natural-resource-intensive production processes. The development of economic infrastructure including logistics is crucially important for economic development through effectively utilizing globalizing forces. Economic infrastructure is vital to the efficient formation of agglomeration as well as the extension of production networks. Proper project design and prioritization are extremely important. Effective use of regional resources for infrastructure development, including public-private partnership, is also required.

In this regard, among the many important issues facing Cambodia, Laos, Myanmar and Vietnam is the need to reduce network-set-up cost and service link cost. Their geographical proximity to growth centers in forerunner ASEAN countries would be a strong point and thus, efforts for deeper integration such as the appropriate infrastructure policies are essential toward economic integration.

Public-private partnership can play a significant role in infrastructure development. Several countries have successfully used the Build-Operate-Transfer (BOT) approach, a particular form of public sector-private sector partnership to address the infrastructure needs of the economy. It is seen as an option to outsource public projects to the private sector, which takes charge of design, financing, construction and operation of the facility under a concession agreement. During the concession period, the private party

[3] ERIA Interim Report, July 19, 2007

operates and maintains the facility. At the end of a fixed cooperation period, the ownership, free of any encumbrances or liens, is transferred to the government at no cost.

The development of Suez Canal was done through the BOT approach (Levy (1996). The first official private facility development under the name "Build-Operate-Transfer" was used in Turkey in 1984 to develop infrastructure. Private financing was used to develop railways and roads in the western world in the second half of the nineteenth century (Menheere and Pollalis, 1996).
The Philippines was reported as the first country in Southeast Asia to enact a BOT law and the Ramos administration successfully used it to solve the critical power problem of the nineties.

Thus, in the Philippines, donors, the government and the private sector have all pinned high hopes in using BOT schemes to solve the infrastructure lack, which investors have identified as a principal barrier to investments. However, the role of the BOT approach in addressing the infrastructure lack in Asian developing countries, which have used it seems to have diminished following the aftermath of the Asian financial crisis as private investors focus their attention elsewhere.

1.2. Objectives of the paper

This paper attempts to provide a brief review of the experience of the Philippines with the utilization of the BOT approach for infrastructure development in order to draw lessons for policy makers on how to improve the use of this strategic instrument for infrastructure provision. The paper is organized into four sections. After a brief introduction, section 2 explains the Build-Operate-Transfer (BOT) approach for providing infrastructure and how it is used by developing countries such as the Philippines to provide much-needed infrastructure. Section 3 provides two case studies of BOT projects in the Philippines, which are used to draw lessons for policy makers that will be reported in the final section. Admittedly, two case studies do not provide enough information for making generalizations and conclusions about the BOT

experience in the Philippines. Nevertheless, the paper used them to indicate in broad strokes the areas where PSP and BOT implementation could be improved. A more extensive and in-depth study of BOT projects, which can overcome the limitations of drawing lessons from two simple case studies, should be done in the near future.

2.THE BUILD-OPERATE-TRANSFER APPROACH FOR INFRASTRUCTURE PROVISION

Governments have traditionally been in charge of providing infrastructure, including its financing based on the conviction that infrastructure partakes the nature of a public good that the public sector is obligated to provide. In fact, many countries in East Asia report that it is still government or the public sector that provides most of the infrastructure in the region[4]. However, pure public sector provision has yielded to private participation in infrastructure as a mode for making available infrastructure. Several factors have driven many countries to use private participation as an important instrument to provide infrastructure. Malhotra (1997) summarizes the reasons for private participation in infrastructure:

- Investment requirements exceed the capacities of national utilities and governments;
- The performance of the infrastructure sector has, in general, not met international standards;
- The managerial and technical resources available to the government are inadequate;
- Innovations in technology (for example, small but economic combined-cycle power plants fueled by gas) permit the unbundling—vertical and horizontal—of the power sector);
- Demonstration effects arising from the success of privatization and unbundling efforts, for example, in the United Kingdom) and the possibility of using

[4] Country representative comments made during the Workshop of Economic Research Institute of Asia (ERIA) infrastructure project (final meeting), JETRO-IDE Research Center, Bangkok, Thailand, January 20-21, 2008. The countries represented in the workshop are the following: People's Republic of China, Indonesia, Myanmar, Thailand, Cambodia, Malaysia, Philippines, Singapore, Lao PDR, Vietnam, Japan and India.

regulation to protect the public interest (for example, the incentive regulation and yardstick regulation used in Spain) are making new approaches to upgrading infrastructure viable);

- The limited coverage and quality of some countries' infrastructures are hindering their efforts to achieve international competitiveness.

The Build-Operate-Transfer (BOT) approach is part of a range of ways with which the private sector participates in infrastructure provision. It has been widely viewed as a pragmatic approach in infrastructure provision in countries where severe budgetary constraints limit government's capacity to provide it.

2.1. Economics of BOT projects[5]

One of the recurring arguments supporting government provision of infrastructure projects relies on a case of market failure. For a variety of reasons, even if people value a service from a given infrastructure project, say, from a road or a bridge, they will hesitate to reveal the price that they are willing to pay for the service. If users can free ride, they will.

At times, it may not be possible technologically and at reasonable cost to exclude potential users from non-users of the service. Once the service is provided to one, it must be provided to all. Again, people will not reveal the price they are willing to pay for the service since everybody else can benefit. No market will emerge. In other words, it's a public good. The usual example is national defense, a pure public good.

Pricing of the service is not possible and so if one were to rely on markets guided by a price system, the project will never be built. As a result, a need is not met and in the overall, society's welfare suffers. And so the government steps in to provide the service through a tax-and-subsidy scheme.

[5] This was prepared by Prof. Dante Canlas as part of a technical memorandum on a review of the (Philippine) BOT law conducted by Dante Canlas and Gilberto Llanto on May 14, 2006, unpublished paper.

But in some cases—such as, toll roads and bridges-- pricing is possible. The services from these infrastructure projects can be extended only to those willing to pay the charges. Unlike some pure public goods wherein markets fail, it is possible to exclude non-payers in a relatively inexpensive way. User charges can be imposed, allowing project investors to recover operating costs plus normal profits. In this setting, a BOT scheme may be invoked.

The delegation of a government infrastructure project to a concessionaire is especially helpful in time of tight budgetary constraints, when discretionary spending of the national government budget is either being cut or just maintained in current peso terms. In this context, the private sector can be tapped to invest in the infrastructure program of the government. Evidently, however, this is contingent on the project being able to provide a reasonable rate of return to private investment.

To be able to realize a mutually agreed-upon rate of return to investment, the concessionaire relies mainly on a user charge that is regulated. People who pay the administered fee can avail of the service provided by the project. Those not willing to pay are excluded. And so since pricing is possible, users, instead of taxpayers, pay for the operating cost and normal profit due the concessionaire. It seems unfair to use revenues from general taxation to finance or provide subsidy or support to a BOT project, which is availed of by particular segments of the population, that is, the users.

For the concessionaire, the likelihood of achieving the rate of return to its investment rests on several factors, including, the allocation of risk bearing between itself and the government granting authority. A contract is written, spelling out the rights, obligations, and contingent claims of the concessionaire in case a particular state of nature occurs.

The contract is a comprehensive document that spells out private property rights, decision rights, risk-sharing arrangements, and third-party intervention if contractual disputes arise. In view, however, of imperfect information and limited ability of the parties to anticipate all possible states of nature at the time of contract writing, all contracts are incomplete. They thus provide for contract renegotiation when some

unanticipated states of nature occur.

Ambiguity of language is bound to occur in a written contract, which can give rise to a contractual dispute. A court case may ensue unless the parties agree to third-party arbitration. Third-party arbitration may involve lower transaction cost than court arbitration. Hence, both parties choose to provide explicitly for such arbitration in the contract as a mode of dispute settlement.

The realization of a specified rate of return hinges on a strong partnership between the concessionaire and the government granting authority throughout the period of cooperation. For one, the durability of the partnership depends to a great extent on the presence of technical, legal, and financial expertise at the level of the granting authority; such expertise, if present, enables the latter to engage the concessionaire in meaningful discussions on a wide range of relevant issues at project-entry level and during project implementation.

On pricing, user fee at entry level and its predicted time path during the cooperation period are vital to achieving the desired financial stability and profitability of the project. A highly regulated fee structure may prove to be a deal breaker for the government granting authority and the concessionaire. One reason is that bank financing may not be forthcoming if projected operating revenues are vulnerable to regulatory risk; banks may view a fee-setting procedure that is tightly regulated as putting loan servicing excessively at risk. Evidently, it is important to pay close attention to creditors' preference; otherwise, a BOT contract may not be written.

Moreover, administering the user fee rests on a number of factors. One factor to consider is the sensitivity of demand for the service to pricing. If the regulator sets the user fee at a very high level, there is a risk that many potential users will be discouraged from availing of the service. If target revenues are not realized, the project may lose, and eventually fail. In this regard, the two parties negotiate at the start possible monetary and non-monetary incentives to the project, which are then built into the contract.

It seems clear that the degree of success of a project delegated by the government to the private sector rests on several factors. These factors are indicated in various stages of development of a BOT project; they affect project quality at entry level, during contract writing and implementation, and in the course of regulating user fees.

2.2. Description of a typical BOT project[6]

The understanding of the whole BOT approach starts on how well the interplay of various actors in the project structure, timing of the BOT process, the goals and incentives each participant/actor in the process aspire for, the risks they face in attaining those goals and the ways they mitigate those risks through various contractual arrangements.

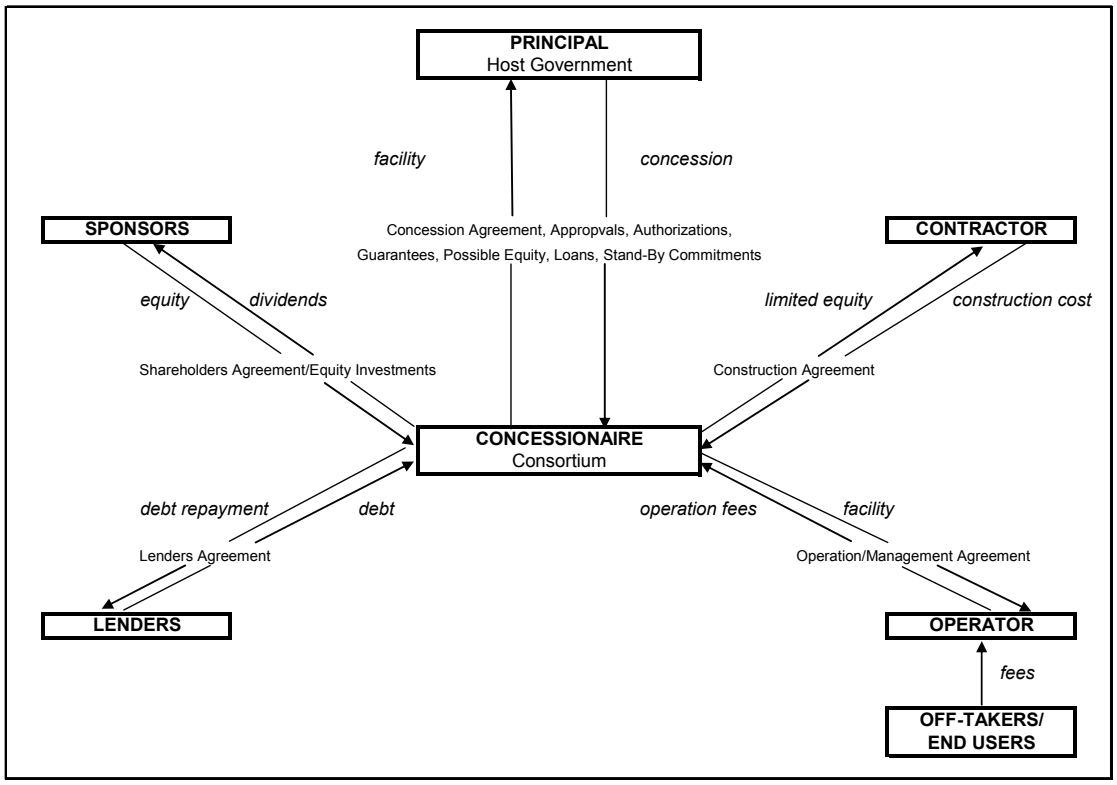
Although BOT may be a popular alternative, it is a complex approach because of the presence of different actors with particular goals, objective functions and interests, the need to reconcile or harmonize these varying objectives to meet a particular infrastructure goal, the presence of many risks affecting BOT projects and the need for the different actors to agree on risk sharing allocation and the use of risk management techniques to minimize those risks. Figure 1 shows the complex relationship among different actors in a BOT project.

BOT is an approach where:

> "…a private party or concessionaire retains a concession for a fixed period from a public party, called principal (client), for the development and operation of a public facility. The development consists of the financing, design and construction of the facility, managing and maintaining the facility adequately and making it sufficiently profitable. The concessionaire secures return of

[6] The description on BOT approach in this section draws heavily from two major references: Menheere and Pollais (1996) and Augenblick, M. and B. Custer, Jr. (1990). I am indebted to Karl Jandoc, research associate, Philippine Institute for Development Studies for summarizing the work of these authors.

investment by operating the facility and, during the concession period, the concessionaire acts as owner. At the end of the concession period, the concessionaire transfers the ownership of the facility free of liens to the principal at no cost". [Verhoeven (1995) as cited in Menheere and Polais (1996)]



2.3. Major participants in the BOT process

There are several variations of the BOT approach, depending on project specifications that attempt to address particular infrastructure problems. There remains, however, a generic structure for these projects. The principal (usually the government) will grant the concession to the concessionaire, which is typically a consortium of companies. The role of the concessionaire is on the financing and development of the project and they source their funds from both sponsors and lenders. Finally, the contractor builds the facility which is subsequently managed by the operator.

2.3.1. Principal

Host governments may draw up lists of infrastructure investments in accordance to their overall economic and development plans. If it is constrained to fully financially support the investments, the government then solicits proposals from private companies to implement these plans. The usual mode is via a competitive tender of infrastructure projects. However, depending on the BOT law of a country private participants may submit unsolicited proposals to undertake a specific infrastructure project. The host government either approves or disapproves the unsolicited project proposal. Upon approval of a solicited or unsolicited project, the host government typically grants the private company a concession that may last anywhere from ten to fifty years (or more). The principal (that is, the government) takes ownership of the facility and the assets after the concession period. It is well known that developing country governments rarely adopt a laissez-faire approach to these projects. Sometimes they provide a portion of the required financing or provide guarantees, subsidies or similar support to make the project more attractive and viable to private investors.

2.3.2. Concessionaire

Once all the relevant review and approval processes are followed, the concession is granted to the concessionaire, which is usually a group of companies interested in undertaking the design, finance, construction and operation and maintenance of the infrastructure project or facility. The property rights of the facility (or the assets) rest with the concessionaire during the specified concession period wherein the private investors/owners try to recover their investments and earn profits.

2.3.3. Investors (Shareholders and Lenders)

An integral part of the undertaking of the BOT project is the presence of credible and capable investors to provide the financing needed. These investors include shareholders and lenders. Shareholders infuse money in exchange for equity and

lenders provide credit financing to the consortium which negotiates with the principal for certain guarantees or credit enhancements to the make the project attractive to the lenders. There are two broad categories of equity providers: (i) those that have a direct interest in the operation of the project such as contractors, operators or the host government itself and; (ii) those that are solely involved as equity investors such as public shareholders and other institutional investors. Lenders are oftentimes commercial banks, insurance companies, multilateral lending institutions, and the like.

2.3.4. Contractor

BOT projects involve large-scale building and construction of a facility. In practice, the concessionaire taps the services of a contractor to construct the facility under the project. In some instances, the contractor is part of the consortium for reasons which will be discussed later. The contractor also hires subcontractors, suppliers and consultants.

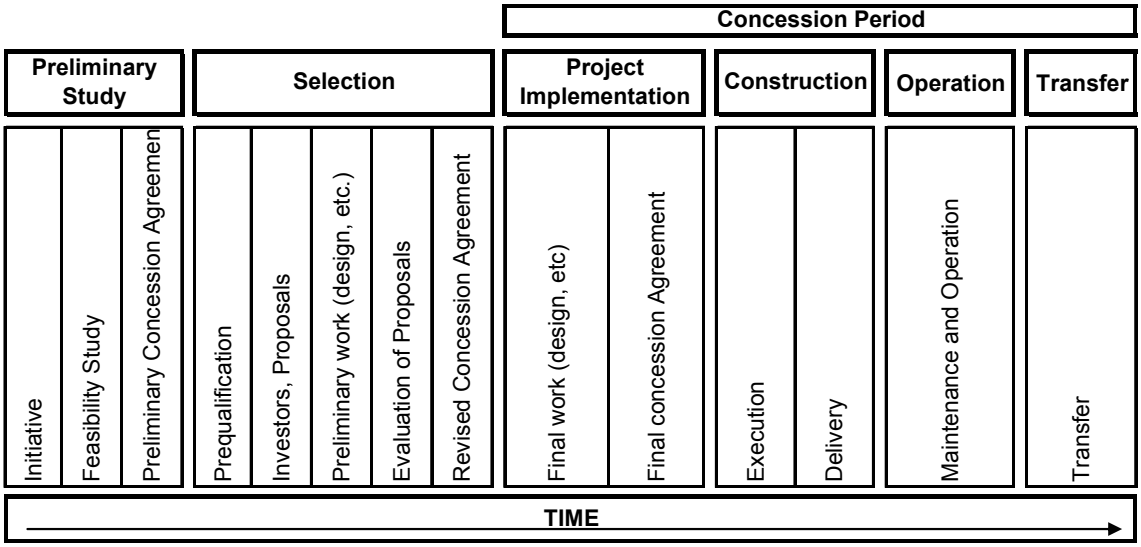
2.3.5. Operator

After completing the construction of the infrastructure facility, the concessionaire then secures the services of the operator to manage and operate the facility. The operator is oftentimes one of the entities in the consortium which has an intimate knowledge of the business and the local environment.

2.4. Stages in the BOT process

Most of the BOT projects undergo six identified stages. Figure 2 below shows these six stages and the principal activities contained in each of them. It can be roughly divided into two parts covering those happening before and during the concession period. In the first part of the process a feasibility study is done and then a consortium is awarded the concession to build and operate the facility. In the second part the concessionaire starts to implement the project by obtaining the necessary requirements, designing the facility and constructing it. The facility is then used to generate revenues for the concessionaire and, after a specified period, transfers the ownership of

the facility and its assets to the host government.



2.4.1. Preliminary Study

Usually the government identifies the infrastructure priorities and the facilities that have to be built. In the case of the Philippines, the government prepares a Medium Term Public Investment Program that lists the priority infrastructure projects that the public sector and the private sector are expected to design, finance and construct. Some of those projects are identified as projects that may be implemented through the BOT approach. The government may then contract independent parties to conduct feasibility studies to determine the potential viability and desirability of the project. Projections of profit streams are done here to determine the viability of private sector participation. In the Philippine experience, some enterprising private sector proponents directly submit to the government unsolicited project proposals that they think could address some infrastructure lack. Thus, while the Philippine government takes the initiative with respect to solicited projects on the one hand, private sector proponents may take the first step with unsolicited projects, on the other hand.

2.4.2. Selection Process

As stated above, there are two basic avenues for the BOT approach: solicited and unsolicited project proposals. The former refers to the general *public selection* or

public bidding process. Here, the government disseminates request for submission of expression of interest to provide a particular infrastructure facility and upon receiving applications it requests some pre-qualified consortia to submit their proposals. The proposals are then subject to evaluation. The Philippine government uses the "two-envelope system" to evaluate the proposal. Under the two-envelope system, the evaluation based on technical merits is followed by financial evaluation that considers the financial viability and economic benefits of the project. The concession is then awarded to the proponent, which has successfully passed the technical and financial evaluation. Under the unsolicited mode a private proponent submits a proposal directly to the government. In contrast to the solicited mode where government takes the initiative in asking private parties to submit a project proposal, the private party makes the first move under the unsolicited mode. If deemed acceptable, the proposal is opened up to some form of competition (e.g. Swiss challenge) to determine who will undertake the project. After the necessary evaluation process, the project is granted to a concessionaire.

2.4.3. Project Implementation

After the concession has been granted, the consortium will then develop a specific work program, including drawing up project designs and detailed engineering, obtaining necessary legal permits to facilitate the project, etc. It is during this phase that potentially conflicting or competing interests of all stakeholders (e.g. communities affected, environmental issues) are balanced to ensure support or acceptance to the project and its speedy completion.

2.4.4. Construction

After satisfying the necessary legal, environmental and social requirements, the construction of the infrastructure facility begins. This is usually undertaken by the contractor who has also hired the construction crew, suppliers and technical and project management consultants.

2.4.5. Operation

After the facility is built, the concessionaire designates an operator to operate and maintain the facility. The operation lasts until the termination of the concession period.

2.4.6. Transfer

Upon completion of the cooperation or concession period, the ownership of facility and all its assets is then transferred to the host government. Transfer can also be done prior to the expiration of the concession period but the concessionaire has to be compensated properly for the investments made in the project. The government may then operate the facility itself or decide to hire an independent operator.

2.5. Goals and typical contractual agreements of the major participants

The presence of several actors and the different stages of a BOT project result to a complex relationship, which make imperative close cooperation and collaboration to ensure that the project will push through to completion and efficient operation with a minimum of problems. The participants in the BOT project may have different objectives and goals, which sometimes may conflict directly with each other. For instance, the host government may want to provide the widest access possible to the use of the infrastructure facility and this may involve controlling fees or regulating fee increases in order to make the facility affordable to members of the community. On the other hand, the concessionaire and the investors who want to make profits or have a high return on their investments may consider charging higher user fees for the facility. Lenders aim to make their long-term loans safe and profitable. Equity investors want to have a high return on investment in proportion to the risks they face. The contractor wants to increase the price of their contract for the construction of the facility. The users aim to use the facility at the least cost to them. In certain cases, there could even be expectations that the government should provide the facility for free. Therefore, there must be some mechanism that will provide the incentives to balance these diverse and

oftentimes conflicting goals. The *contract* is the principal means by which parties align their individual goals to make the project operational. There will naturally be a great number of contracts among all the involved parties in the BOT project. The following are the main contracts that are inherently present in all these projects:

2.5.1. Concession Agreement

This is the agreement between the host government and the concessionaire. It is the main contract in a BOT project. Under the concession agreement the following are specified:

- The concession period—the starting date and the terminal date
- The structure of the concessionaire
- The financial scheme
- The construction duration and process
- Tariff structure with tariff revision provisions
- Rights and obligations of both parties, that is, the government and private party
- Guarantees (financial and material)

2.5.2. Loan Agreement

The loan agreement is made between the lenders and the concessionaire and specifies the amount to be lent with the specific repayment period and mode, the different guarantees and the agreed terms of the. The limited recourse nature of BOT projects may prompt lenders to demand adequate security. This contract may include the provision that project revenues be stored in one or more special debt reserve escrow account to ensure payment of senior debt before any distributions can be made to equity investors (Augenblick and Custer, 1998). Other guarantees may include the right for the lenders to take over the operation of the facility in the event that the concessionaire is not able to meet financial obligations. In other instances, the concessionaire negotiates with the host government for guarantee of the loans made with creditors.

2.5.3. Shareholder Agreement

The shareholder agreement is between equity investors and the concessionaire. Equity financing is oftentimes raised by the consortium's own capital funds although other external equity investors may infuse funds. The contract specifies the detailed agreement on the mode of payment and the distribution of revenues and dividends to the investor and the prescribed debt to equity ratio.

2.5.4. Construction Contract

The contract between the construction contractor and the concessionaire is usually a fixed price turnkey contract. There also may be a single overall contract which encompasses both design and construction. The fixed price turnkey contract may be the most efficient contract to reduce the risks related to project time, quantity and costs. The penalties for late delivery of the contractor are stipulated in this contract.

2.5.5. Operation and Maintenance Contract

This contract plays a very vital role since this has serious implications on the revenue generating capability of the project and the longevity of the asset. Specifics may include the level of rates or user charges for the facility, the formula or procedure for rate adjustment, details of the use of the facility, reimbursement for maintenance costs and others.

To be successful, a BOT project should be able to harmonize and reconcile all these contracts to meet a common end: an efficient infrastructure that provides good service to the public and satisfactory rates of return to investors, shareholders, the operator and lenders. Harmonization is not an easy task. It should be borne in mind that these contracts reflect the risk-bearing ability of the parties concerned and the tendency for any party is always to minimize the risks it faces and transfer these as much as possible to parties most able to bear them. This requires a very good understanding of the nature of the risks faced by all actors, e.g., the likely events that would trigger the occurrence of the risk and the appropriate risk mitigation instrument. Transparency in

contracting which specifies who is responsible in bearing a particular risk will help to ensure that opportunistic behavior and confusion will be minimized. The next section presents some of the most common risks that a typical BOT project will face and of the risk management and mitigation responses that can be incorporated in the contract.

2.6. Risks faced by major participants

One of the means for a BOT project to succeed is to mitigate the risk that can be identified. Risks are often within the control of one or more of the participants but some are out of the participants' hands. A basic principle is that the party who is in the best position to manage the risk should bear that particular risk and should be duly compensated for it. Moreover, exposure to risks is oftentimes greater in the earlier stages of the project and so monitoring must be more intense during the early stages. The most common risks in a typical BOT project are listed below.

2.6.1. Completion Risk

In any typical BOT project, there is a risk that the construction may not be completed on time and in the agreed price. The solution to this risk is for the concessionaire to offer a fixed price, firm date, turnkey construction contract with concomitant penalties stipulated by liquidated damages. This clause states the monetary damages payable by the contractor for each unit of time delay in the completion of the project or the completed project's inability to meet specifications. Thus, cost overruns, hidden defects, and other related problems become the responsibility of the construction contractor. The price of the turnkey contract then reflects the risk that the construction contractors have to bear. Another way to obviate completion risk is for the consortium to include the construction contractor as a partner or participant in the consortium. In this way, the information asymmetry between the concessionaire and the construction contractor, which may give rise to moral hazard problem, will eliminated.

2.6.2. Performance and Operating Risk

There is also a risk that a project will not perform according to what is expected from it.

These failures may include technical failures, interruption and management or labor incompetence. This may be mitigated by warranties from the construction contractors and equipment suppliers and also by performance guarantees in the operating and maintenance contract.

2.6.3. Cash Flow Risks

Disruptions of cash flow may jeopardize the repayment of debt to the project's lenders. These disruptions are usually precipitated by a change in market demand conditions: for instance, sudden disruption of tariff revenue brought about by a downturn in purchasing power of the consumers. The usual response is to specify in the contract the opening of an escrow account as what was discussed earlier. Another is for the host government to guarantee a portion of the revenues generated by the facility, for instance, a minimum off-take agreement.

2.6.4. Inflation and Foreign Exchange Risks

Rapid inflation and exchange rate spikes may alter the returns to both lenders and equity investors. These risks are deemed to be beyond the control of lenders and equity investors but may be addressed by government policy action. This is the reason why host governments are almost always asked to provide cover for these risks. For instance, indexation of user-fees and revenues from off-take contracts are used to cover for the risk of inflation. Governments are also asked to provide sufficient foreign currency in case of supply disruptions or index the tariff rates to the rate of inflation to preserve the real value of profits.

2.6.5. Insurable Risks

Insurable risks, e.g., manpower casualty, can be sufficiently covered by various form of insurance. The insurance may come from commercial sources or from government guarantees.

2.6.6. Force Majeure

These risks are sometimes uninsurable or can be insured at a very prohibitive cost. The government may be asked to cover or seek cover for force majeure risks that are uninsurable. Force majeure risks are often insured by entities such as the Overseas Private Investment Corporation (OPIC) and the Multilateral Investment Guarantee Agency (MIGA).

2.6.7. Political Risks

These risks may, in general, include any deviation by the host government from any specific undertakings or agreement provided in the project. It also includes risks such as those precipitated by political violence—war, insurrections, or sabotage that may disrupt the operation of a BOT facility. This also includes problems of law and order, the threat of expropriation or nationalization by the host government or even a change in political leadership, which questions the legality or appropriateness of a BOT project approved by the predecessor government. Foreign commercial lenders and equity investors want to seek political risk insurance from sources such as the government itself (through sovereign guarantees), export credit agencies or other multilateral agencies.

2.6.8. Regulatory Risks

The regulatory regime also posts some risk with regard to tariff rates, volume or quality of services. Rules may be hazy or easily subjected to political intervention, which put at risk the viability of the BOT project, e.g., fixing or controlling charges/fees, unclear formulas for rate or fee adjustment, and others. The creation of credible and independent regulatory agencies is seen as the first step to mitigate such regulatory risks.

2.7. Risk mitigation instruments

There may be some risks that cannot be or are too prohibitively costly to insure. To encourage private investors, the government usually intervenes by providing guarantees,

subsidies and similar support. It seems that BOT projects in developing countries are in reality rarely a 100 percent private undertaking with no commitment from the host governments. There are several factors such as underdeveloped capital markets, political instability, regulatory uncertainty and others that may deter private investments in infrastructure and thus, the government steps in to eliminate or minimize such risks to the project. The following are the some of the common support given by governments for the development and implementation of BOT projects:

2.7.1. Political and Bureaucratic Support

Strong political support by the highest leadership of the country is an effective way to facilitate the acceptance of any project. A president, prime minister or key legislators championing the cause of private participation in infrastructure can thwart bureaucratic resistance from entrenched public sector entities, which could have an interest to build and operate the facility itself instead of the private sector. The political leadership can as well convince the doubting citizenry about the importance of the BOT facility through effective communication of its advantages to the community and transparent procedures for review and approval of the project, among others.

2.7.2. Assured Supplies

Government may provide some logistical support such as land, right-of-way, raw materials or steady supply of energy required during the life of the BOT project.

2.7.3. Assured Revenues

In instances when the government is a major purchaser of a BOT output, it commits to a steady revenue stream to make the project viable, thereby attracting both lenders and equity investors to provide funding to the project. For instance, the government could pledge a "minimum off-take" or "take or pay" guarantee for the power generated from BOT-built power plants or guarantee ridership in a rail project in order for the concessionaire to be able to pay off both debts to lenders and dividends to equity

investors.

2.7.4. Loans/Equity Contributions

In some instances, government may provide loans or infuse capital to BOT projects. This helps the concessionaire to be more independent from lenders and sponsors and gives it more bargaining power to negotiate for construction contracts and equipment supplies. Transparency is also the reason why governments provide loans and equity. The government can demand transparency of the project's financial structure in return for the support.

2.7.5. Earning Assets

Government can also allow public sector assets to be used by the concessionaire to pay capital costs, debt service and operating expense. Examples are public toll roads, which are made available to the concessionaire after award of the operation and maintenance of the toll road.

2.7.6. Regulatory, Fiscal and Other Support

There may be legislation needed to help the private company push through with the project. Enabling laws can be passed by legislators to make the legal and regulatory environment conducive to long- term private investments. Some form of tax incentives such as tax holidays, exemption from stamp and customs taxes may also be given to BOT concessionaires. Salaries of foreign expatriates may also be exempt from local taxes.

2.7.7. Project Risk Support

In case of project failure or interruption in the cash flow of the facility, government can intervene to provide loans on a standby basis over a fixed period of time to provide for debt service.

2.7.8. Inflation and Foreign Exchange Cover

These covers may come in the form of price escalation clauses initiated by the government. Indexation of user fees or tariffs to inflation is the most common form of support although the form and timing may be politically costly and time consuming to develop or organize. In the case of rapid foreign exchange fluctuation, the government must be able to assure foreign investors of the convertibility of local currency earnings into foreign currency and that it will provide sufficient foreign currency to meet the demand of these investors.

2.7.9. Sovereign Guarantees

Sovereign guarantees are called upon in the event that the concessionaire defaults in the payment of a loan to its lenders.

2.7.10. Protection from Competition

Government can influence the environment to make the BOT project more viable. For instance, it can stop the development of parallel non-toll routes to make the toll routes more profitable during the concession period.

3. TWO BUILD-OPERATE-TRANSFER CASE STUDIES

The Medium-Term Philippine Development Plan (MTPDP) 2004-2010 recognizes private sector participation as key to infrastructure development in the country. In a recent workshop organized by the Philippine Development Forum, it was claimed that "public-private partnership (PPP) would be only a viable option for key infrastructure development in the short-term, given the fiscal conditions of the Philippine Government"[7].

[7] Report of the Philippine Infrastructure Workshop (page 4), "Philippines Infrastructure and Business Climate Workshop," Makati Shangri-la Hotel, Makati City, March 1, 2006

The Philippine BOT Center[8] reports that as of June 2006, there are a total of 90 private sector participation projects (PSP) with an aggregate estimated cost of US$ 23 billion, which are either completed/terminated, operational, awarded or under construction, or in the pre-award stage. Seventy four out of the 90 PSP projects amounting to about US$ 20 billion represent those which are already completed, in operation, awarded and under construction. From this list of BOT projects, the author has selected two BOT projects, which will be used to exemplify the Philippine experience that will help to indicate key lessons for policy makers and various stakeholders.

3.1. BOT Legal Framework

The energy crisis in the late 1980s and the weak fiscal position of the government created the motivation for government to seek private sector support in carrying out priority infrastructure projects. The Philippine Congress enacted in December 1990 the Build-Operate-and-Transfer (BOT) law, otherwise known as Republic Act No. 6957, "An Act Authorizing the Financing, Construction, Operation and Maintenance of Infrastructure Projects by the Private Sector and for other purposes." Said law was subsequently amended by R.A. No. 7718 in April 1994 to strengthen the motivation for private investment in the infrastructure sector. The amended BOT Law listed the different modes of public-private participation in infrastructure and introduced the unsolicited proposal process as a valid implementation mode. The amended BOT law provides that "unsolicited proposals for projects may be accepted by any government agency or local government unit on a negotiated basis: Provided, That, all the following conditions are met: (1) such projects involve a new concept or technology and/or are not part of the list of priority projects, (2) no direct government guarantee, subsidy or equity is required, and (3) the government agency or local government unit has invited by

[8] Pursuant to Section 12 of RA 7718 the Coordinating Council of the Philippine Assistance Program (CCPAP) was identified as the agency responsible for the coordination and monitoring of projects implemented under the BOT Law. CCPAP was later reorganized and converted into the Coordinating Council for Private Sector Participation (CCPSP), by virtue of AO No. 67, series of 1999, as amended by AO No. 103, series of 2000. EO 144 dated November 2002 provided for the conversion of the CCPSP to the current BOT Center and transferred as an attached unit from the Office of the President (OP) to the Department of Trade and Industry (DTI). The BOT Center is mandated to provide project development assistance and monitoring functions in addition to promotion and marketing of the BOT/PSP program to prospective investors/developers and government agencies.

publication, for three (3) consecutive weeks, in a newspaper of general circulation, comparative or competitive proposals and no other proposal is received for a period of sixty (60) working days: Provided, further, That in the event another proponent submits a lower price proposal, the original proponent shall have the right to match that price within thirty (30) working days".

The first wave of BOT projects involved the execution of power purchase agreements (PPA) between the National Power Corporation (NPC) and independent power producers (IPPs) to address the energy crisis faced by the country. These were followed by water, road and transport projects.

3.2. Case Study No. 1: Ninoy Aquino International Airport (NAIA) Terminal III[9]

Terminal III is a 189,000 square meter facility, which started construction in 1997 and was intended to start operations in 2002. The modern US$640 million facility was designed by Skidmore, Owings and Merrill (SOM) to have a capacity of 13 million passengers per year or 33,000 passengers daily at peak or 6,000 passengers per hour. Based on design, it has the following features: a 4-level shopping mall connecting the terminal and parking buildings; a parking building with 2,000-car capacity and outdoor parking which can accommodate 1,200 cars; 34 air bridges and 20 contact gates with the ability to service 28 planes at any given time; 70 flight information terminals; 314 display monitors, with 300 kilometers of fiber optic I.T. cabling; 29 restroom blocks; five entrances in the departure area equipped with X-ray machines; and 7 large baggage

[9] References for Terminal III Issues:
(a) Rimando, Lala, "Government Wins One of its Biggest International Arbitration Cases" NewsBreak (online), Public Trust Media Group, Inc. Friday, 17 August 2007.
(b) Santos, Rafael S. "Businessmen remind government to keep policy on course" Manila Times, Thursday, September 14, 2006.
(c) Supreme Court Jurisprudence, En Banc Decision, Agan Jr. vs. Piatco, G.R. No. 155001, 155547 and 155661, May 5, 2003.
(d) Landingin, Roel, "A commercial compromise: a less than perfect solution may be the only way to open NAIA-3," Newsbreak, Sunday, February 11, 2007 http://www.newsbreak.com.ph/index.php?option=com_content&task (date accessed January 14, 2008)
(e) http://en.wikipedia.org/wiki/Ninoy_Aquino_International_Airport

carousels, each with individual flight display monitors.

The original proposal for the construction of a third terminal in Metro Manila was submitted by Asia's Emerging Dragon Corporation (AEDP). The unsolicited proposal was subjected to a challenge by other interested parties. The AEDP lost the bid to PairCargo and its partner, Fraport AG of Germany. Fraport AG and PairCargo then contracted the Philippine Air Terminals Corporation (PIATCO) to undertake the construction and subsequent operation of the terminal. PIATCO is wholly owned by Fraport AG (the operator of Frankfurt airport in Germany), Security Bank and Trust Company, Equitable Banking Corporation, Chuah Huh Holdings Company and the Philippine Airport Ground Services. Construction of Terminal III was begun under the administration of former president Joseph Estrada.

The BOT Contract includes the (a) Concession Agreement signed on July 12, 1997, (b) the Amended and Restated Concession Agreement dated November 26, 1999, (c) the First Supplement to the Amended and Restated Concession Agreement dated August 27, 1999, (d) the Second Supplement to the Amended and Restated Concession Agreement dated September 4, 2000, and (e) the Third Supplement to the Amended and Restated Concession Agreement dated June 22, 2001.

The original agreement was one in which PairCargo and Fraport AG would operate the airport for several years after its construction and then after 25 years of operation, hand it over to the Philippine Government. However, the government offered to buy out Fraport AG for $400 million, to which Fraport agreed. Before the terminal could be fully completed, current president Gloria Macapagal-Arroyo formed a committee to evaluate the agreement to buy out Fraport AG. The Arroyo administration eventually abrogated PIATCO's BOT Contract for allegedly having been anomalous in certain important respects. In a subsequent decision, the Philippine Supreme Court upheld the Philippine Government's position on the matter and declared the BOT contract "null and void" for, among other things, having violated certain provisions of the BOT law. In particular, the decision was based on (1) the absence of the requisite financial capacity of the PairCargo Consortium (predecessor of PIATCO), which is required under the

BOT Law, (2) material and substantial amendments to the 1997 Concession Agreement, which deviated from the original contract bid upon, which is contrary to public policy, (3) the amendments in the 1997 Concession Agreement provided for a direct government guarantee which is expressly prohibited by the BOT Law and its Implementing Rules and Regulations.

The Supreme Court found that the original contract was revised to allow for a Philippine Government guarantee of PIATCO's obligations to its creditors, contractors and suppliers. The BOT law disallows the granting of such sovereign guarantees. The project in question is an unsolicited project and thus, it does not qualify to receive government guarantees. PIATCO maintains that the provisions cited by the Supreme Court do not amount to a prohibited sovereign guarantee by the Philippine Government.

On December 2004, the terminal project was expropriated by the Philippine Government through an order of the Pasay City Regional Trial Court subject to the payment of an initial amount of three billion pesos (US$66 million at Pesos 45:US$1) TO PIATCO. The Philippine Government paid PIATCO the said amount on the second week of September 2006. PIATCO and Fraport AG also filed compensation claims before international parties, particularly, (a) the Singapore-based International Chamber of Commerce Court of Arbitration for PIATCO's US$564 million claim against the Philippine Government and (b) the World Bank's International Center for the Settlement of Investment Disputes (ICSID) in Washington, D.C., United States of America for Fraport AG's counterpart claim amounting to US$425 million. In August 2007, ICSID dismissed Fraport AG's claim for NAIA Terminal III saying that it had no jurisdiction over the matter. On the other hand, PIATCO has indicated that it remains open to reaching an amicable settlement with the Philippine Government.

According to the Philippine Government, NAIA- Terminal III is 98% complete and will require at least an additional US$6 million to complete. The government is in the process of negotiating a contract with the builder of the terminal, Takenaka of Japan. Another factor that continues to delay the terminal's opening is the ongoing investigation of the collapse of a 100 square meter area of the terminal's ceiling. Proposed test runs for NAIA-Terminal III have been postponed indefinitely pending the

results of the investigation and the inspection of the airport terminal.

3.3. Case Study No. 2: Manila North Tollways-North Luzon Expressway[10]

The North Luzon Expressway (NLE or NLEx), also called North Diversion Road, is a limited-access toll expressway that connects Metro Manila to the provinces of the Central Luzon region in the Philippines. It is one of the two branches of the Road-8 major radial road of Metro Manila (Quirino Highway is the other).

The expressway begins in Quezon City at a cloverleaf interchange with Epifanio de los Santos Avenue (EDSA): a logical continuation of Andres Bonifacio Avenue. It then passes through Quezon City, Caloocan City, and Valenzuela City in Metro Manila. Meycauayan, Marilao, Bocaue, Balagtas, Guiguinto, Plaridel, and Pulilan in Bulacan. San Simon, San Fernando City, Mexico and Angeles City in Pampanga. The expressway currently ends at Mabalacat and merges with the MacArthur Highway, which continues northward into the rest of Central and Northern Luzon.

A planned spur route from the San Simon interchange connecting to the existing Subic-Tipo Highway has been temporarily postponed, because of the on-going construction of an interconnection between the North Luzon Expressway and the Subic-Clark Expressway, the latter serving as a direct link between Subic and Clark. The interconnection is located at least 3 kilometers north of Sta. Ines Exit.

The expressway, including Andres Bonifacio Avenue, has a total length of 88 kilometers. The expressway segment has a length of 84 kilometres. It is currently being extended by another 44 kilometers, starting from its current end in Mabalacat, Pampanga up to Tarlac City in Tarlac. Its extension is part of the Subic-Clark-Tarlac Expressway Project. It may be extended up to Laoag City in Ilocos Norte and there are plans to have a spur route going to Baguio City to provide motorists going to the summer capital a fast and safe journey. In the future, the extension will pass through the rest of Tarlac City, Gerona, Paniqui, and Camiling in Tarlac, Bayambang, Basista,

[10] Source: http://en.wikipedia.org/wiki/North_Luzon_Expressway (date accessed January 14, 2008)

Malasiqui, Villasis, Urdaneta City, Binalonan, Pozzorubio, and Sison in Pangasinan, Rosario in La Union, and Tuba, and Baguio City in Benguet.

Originally under the control of the Philippine National Construction Corporation or PNCC, the operation and maintenance of the NLEx was transferred in 2005 to the Manila North Tollways Corporation, a subsidiary of the Lopez Group of Companies. A major upgrade and rehabilitation has been completed in February 2005 and the road has now similar qualities as a modern French tollway. The main contractor of the upgrade and rehabilitation work was Leighton Contractors Pty. Ltd (Australia) with Egis Projects, a company belonging to the French Groupe Egis as the main subcontractor for the toll, telecommunication and traffic management systems. To help maintain the safety and quality of the expressway, various rules are in effect, such as restricting the left lane to passing vehicles only and banning overloaded trucks.

The tollway has two sections: an open section and a closed section. The open section (within Metro Manila) charges a flat toll based on vehicle class and is employed to reduce the number of toll barriers (and associated bottlenecks) within the metropolis. The closed section is distance-based, charging based on the class of vehicle and distance traveled. Class 1 vehicles can use an electronic toll collection system (called EC Tag) to reduce wait times and congestion at toll barriers. A prepaid magnetic card (the NLE Badge) is provided as an alternative payment for class 2 and 3 vehicles. Both systems connect to accounts that can be replenished in various ways. Travelers not using EC Tag or the NLE Badge on the closed system will instead be issued tickets describing tolls for the various exits. In order to save costs concerning toll barriers at exits, many exits on the NLEx have exit and entrance ramps running alongside each other so that both may be serviced with a single toll barrier.

The Lopez Group took on the challenge of providing an efficient transport facility north of Manila and ventured into road infrastructure to improve and upgrade the NLEX on its own accord without seeking for any special privileges from the Philippine Government. Through First Philippine Infrastructure Development Corporation (FPIDC), the Group partnered with the Philippine National Construction Corporation (PNCC), a government-owned and controlled corporation. PNCC's franchise allows it to enter into

joint venture schemes and to choose its partners, without the need for public bidding but of course with the public welfare in mind. The resulting joint venture created the Manila North Tollways Corporation (MNTC) which was organized to provide financing, rehabilitate, operate and maintain the NLEX until 2030. MNTC then invited Egis Projects S.A. of France, Leighton Asia Limited of Australia, and PNCC to partner with it through equity funding and construction of the expressway facility[11].

The rehabilitation of the North Luzon Expressway is a joint venture between the government and the private sector, for which the Manila North Tollways Corporation was granted the concession to finance, redesign, rehabilitate, expand, operate and maintain the NLEX under a Supplemental Toll Operation Agreement (STOA). The STOA was signed in April 1998 by the MNTC, the Philippine National Construction Corporation (PNCC) and the Republic of the Philippines acting through the Toll Regulatory Board (TRB). It was subsequently approved by former President Fidel V. Ramos in June 1998.

Under the STOA, all usufructuary rights, interests and privileges of PNCC were transferred to MNTC. This gives MNTC the right to collect toll fees during the concession period of 30 years so that it may continue to maintain the expressway, recover its investment, and settle the long-term loans used to finance the project. The new NLEX uses a reasonable and internationally-accepted direct road-user fee principle for revenue collection. Unlike government infrastructure projects that are subsidized by taxes (which, in effect, makes non-users of the infrastructure pay for its services through the taxes they pay), the toll fees will only be paid by those who directly use the NLEX. Investments for the NLEX project may only be recovered through toll fees, and not through tax revenues. This ensures that people who do not use the NLEX will not be burdened with the cost of the project. After the concession period, the project roads - plus all developments - will revert to the government at no cost to it[12].

[11] This paragraph and subsequent paragraphs are from http://www.mntc.com/nlex/overview2.htm (date accessed January 14, 2008)

[12] Ibid

Those who do not want to use NLEX have the option of using the parallel (non-toll) road called the MacArthur Highway to reach destinations north of Manila.

Because of the benefits reaped by the country through the rehabilitation of the NLEX, other developing countries are actually using the project as a model for government and private sector partnership. Private sector investment in infrastructure development projects is essential since it enables the government to use its limited resources for other vital services like education, housing, agriculture, and health. The project financing for the project, acknowledged by Project Finance magazine in its February 2003 issue as a "considerable benchmark for transport financing in Asia," was obtained despite the country's low credit rating. The project was named the "Asia Pacific Transport Deal of the Year" in 2001 by the same publication[13].

4. SOME LESSONS FROM THE PHILIPPINE EXPERIENCE[14]

This paper uses two case studies of BOT projects in the Philippines, one a successful project (NLEX), the other an unsuccessful project (NAIA Terminal III), to derive certain policy recommendations that may help improve both the legal and regulatory framework and future implementation of such projects. The experience of two BOT projects indicates the need to address various issues, starting from the legal framework to the level of responsibilities of the government institutions that are involved in the project cycle, i.e., from entry level to implementation and completion. Improvements may be done at the level of both the legal and institutional frameworks, with the latter referring to the role of the oversight agencies project review and approval and contract monitoring and the implementing agencies and private proponents in the actual construction and subsequent operation of the project.

[13] Ibid.

[13] This section draws from Canlas, Dante, Gilberto M. Llanto, Rhean Botha and Domingo Pallarca (2006) and Llanto (2007).

The two case studies illustrate the importance of several factors in BOT projects. At the minimum, an effective implementation of BOT projects hinges on the following: (i) a legal and economic environment that is conducive to a mutually beneficial partnership between the government and private participants; (ii) clarity in articulating the duties and responsibilities of the parties to the contract; (iii) certainty of recovering investments and availability of mechanisms for dealing with risks and unforeseen events and for arbitration in case of dispute between the contracting parties; (iv) transparency and credibility of the government's processes for review and approval of proposed BOT projects and (v) the need of private investors for certainty and stability of contracts made between themselves and the host government.

4.1. Legal framework

On the whole, the BOT Law is a good basic law but it can stand some improvement together with its implementing rules and regulations (IRR). An indispensable condition for the successful implementation of the BOT Law is a legal environment where property rights and contractual agreements are protected and enforced. The present BOT Law's framework for private sector investment in infrastructure has to be clarified by a clear allocation of roles, functions, and duties across the spectrum of participants to the BOT project.

A primary consideration is to be able to distinguish between the roles of the enabling legal framework (the BOT Law itself) and the IRR. The BOT law should provide the enabling framework and clearly allocate roles, functions, powers, duties, and rights among government agencies, namely, the oversight agencies and the implementing agencies involved in the project cycle. It is, after all, a primary statute that establishes government policy and the institutional framework for implementing that policy.

On the other hand, the IRR are normally technical or operational in nature. Thus, they should never be a verbatim copy of the enabling law. What we have now, however, is a BOT law that contains both the enabling policy framework and too many details that are technical or operational in nature. Ideally, the details should be in the IRR so that the

government may have the flexibility to change any of them in view of rapid changes in technology, financial markets, and other factors that impact a BOT project. Because it is hard to anticipate such future changes, having a detailed BOT law may therefore not work in favor of the country inasmuch as the task of amending the law to respond to changes and innovations could be a complicated and time-consuming process.

Hence, it will be much more efficient to have a primary statute that clearly specifies state policy and assigns roles and functions to government institutions and an administrative procedure based on the IRR that may be amended from time to time as the need arises.

At the same time, the past experience with BOT implementation indicates the need to provide a clear legal and regulatory framework not only for BOT projects but also for public-private partnerships (PPP) in general in government infrastructure projects. Such framework must give enough flexibility to the implementing agencies and the oversight body to adjust the rules and regulations governing PPPs as may be required by the passage of time and specific circumstances.

It would thus be useful to revisit the BOT IRR from time to time to take into account financial innovations and advances in technology and engineering, among others, which may change the investment and implementation environment. Contract renegotiation may also be called for and should be provided for in the IRR. The IRR can usually be amended more easily by way of an administrative procedure, thereby avoiding delays that may arise from a usually lengthy and ponderous legislative process.

4.2. Institutional framework

There must be a transparent institutional framework for project identification, review and approval. The Philippine experience shows the importance of having oversight agencies that have the responsibility for project review and approval while line departments or ministries (agencies) are responsible for identifying and preparing terms of reference and scope of work for BOT projects to be tendered. Line ministries

should not be involved in project review and approval because this will conflict with their role in identifying projects that may be financed and constructed under the BOT approach.

An effective implementation of the BOT approach and, in general, public-private partnership requires more accountability on the part of the implementing agencies. Their officials should be accountable for the procurement contract as well as monitoring of the BOT project. Monitoring requires vigilance over delivery by the private proponent of its contractual obligations. The implementing agencies and the oversight agencies should observe transparency, from project identification to procurement to contract implementation. A copy of the signed contract should be available to the implementing agencies and the oversight agencies. As well, BOT contracts are imbued with public interest and should likewise be accessible to the public.

The government should also allow the private proponent to levy user charges that provide a return commensurate to the opportunity cost of its invested funds and that ensure appropriate maintenance of the infrastructure facility. This will ensure project viability. The proper allocation of cost- and risk-sharing is likewise vital. Some risks are uninsurable. In this case, the partnership must allow for some form of co-insurance that provides for sharing of the identified risks.

4.3. Project quality at entry

Government agencies have found it difficult to move BOT projects from the identification to approval stage because of weak technical capacity, and insufficient legal and financial expertise. There are cases when a government agency cannot even put together a credible request for proposals, the first necessary step for competitive bidding, because of weak capacity for project identification and the preparation of project proposals for tendering. This creates the incentive for private proponents to submit unsolicited proposals, which under the Philippine BOT law could be done only under certain conditions as described in Section III of this paper. The government line agency, which is not capable of identifying and preparing projects for competitive

bidding, may also be ill-suited to review unsolicited proposals. The government agency's inability to prepare proposals for tender on the one hand, and to effectively evaluate unsolicited proposals on the other, is a source of frustration on the part of legitimate investors who could help address the inadequacy of Philippine infrastructure. However, the situation of government ineptness provides a venue for non-transparent, back room negotiation over ill-prepared but politically vested projects submitted to the agency for approval.

The lack of project identification and preparation capacity has resulted to the inconsistent application of Section 4 (Priority Projects) in the BOT law and has opened up opportunities to crowd out projects in the priority list. This has created the incentive for the submission of unsolicited proposals- the exceptional case under the BOT law since there is policy preference for solicited proposals, which will be tendered for competition.

The National Economic and Development Authority has proposed the creation of a project preparation facility since the late 1990s. Although the budget department has been supportive, severe budgetary constraints have hampered the allocation of such funds to the implementing agencies. It is timely to consider the provision of specific funding for a project development facility from budgetary resources or grant assistance from donor-partners to jumpstart the process. With a dedicated and well-funded project development facility, the implementing (line) agencies will have the funds to develop in-house capacity or outsource the necessary technical, legal and financial expertise to help them structure a good project proposal for tendering.

4.4. Contracts and regulation

Another difficult area is the writing of a contract governing the BOT project and getting the contracting parties, that is, the government represented by an implementing agency and the private party to agree on the terms and conditions of the contract. The implementing agencies must have a good understanding of the obligations of each party in a project; the financial terms and conditions for the financing provided by external

creditors, including guarantees, subsidies, or equity to be provided if the project is eligible; and contractual provisions on risk allocation, including assisting the project secure financing and ensuring its financial viability and sustainability, among others. Implementing agencies do not necessarily have the skills for contract writing and review in contrast to their private sector counterparts who normally would have access to top level financial and legal expertise.

The result is that during negotiations, the implementing agencies may not adequately understand the implications of the contractual provisions that would form as the legal basis for the financial, construction and operation of the BOT project under consideration. This results in a weak negotiating or bargaining position vis-à-vis the private sector, which may impair the ability of the implementing agency to maximize gains for public interest. Obviously, the implementing agencies must develop capacity not only for contract writing but also for negotiation and monitoring of contract implementation.

An example of a complex area is the provision on *Contract Termination*, a standard provision in contracts. The language for the said provision should be thoroughly understood by the government agency concerned, reviewed and tailored to ensure that public interest is protected in the event of a termination of the contract. The private investor interest will almost surely be protected given their access to the best legal advice that money can buy. Creditors normally demand certain provisions on contract termination as a protection. They do not lend to projects unless such provisions are categorically expressed and are enforceable.

4.5. Unsolicited proposals

There is a need to review whether or not it is really useful to have a provision in the law on unsolicited proposals. These have been the source of controversy in many discussions because their inclusion leads to a situation where the element of competition is not adequately considered or observed, notwithstanding the so-called Swiss challenge that has been devised by legislators as a "cure" to the lack of competition. Building

capacities in the implementing agencies for identifying projects for competitive bidding will minimize, if not eliminate, the need for a provision on unsolicited proposals.

On the other hand, there is merit in allowing private proponents to submit unsolicited proposals because of their access and familiarity to cutting edge technology and innovations that could inform BOT projects. The country may benefit from having efficient, cost-effective and innovative infrastructure facilities that may be provided by those unsolicited projects. In this regard it would be useful to improve the mechanism for allowing challenges to the unsolicited project. The selection process could be made contestable by giving potential challengers sufficient time to match the unsolicited project with their own proposals. Transparency and integrity of the selection process would be indispensable.

4.6. Third party evaluation of projects

It will also be good to introduce as a norm the evaluation of projects during actual implementation and also after a period of time following their implementation. The idea is to assess whether or not actual project implementation delivers the development outputs envisaged during the proposal and approval stages. The evaluation should be done by independent organizations such as reputable research and academic institutions. Implementing ministries or agencies and the private proponent/operator of the BOT project should make available to third party evaluators such data as may be necessary for proper evaluation

4.7. Conclusion and policy recommendations

Recent experience with the implementation of the build-operate-transfer (BOT) Law indicates the need to address various issues, starting from the legal framework to the level of responsibilities of the government institutions that are involved in the project cycle, i.e., from project entry level to implementation and completion. Improvements should be introduced at the policy, legal and institutional frameworks in order to improve the usefulness of this approach to infrastructure development. Because of the complexity of the BOT process for infrastructure development it will be useful to

consider the following policy recommendations arising from lessons culled from the Philippine experience with the implementation of this approach. In conclusion, the main strategic approaches to strengthen PPP and the use of BOT are as follows:

1. It is recommended that the government should provide an enabling framework for private participation in infrastructure provision, that clearly allocate roles, functions, powers, duties, and rights of the government and the private sector. A specific instrument for private participation in infrastructure provision is the Build-Operate-Transfer approach.

2. It is recommended that a clear policy framework on the BOT approach should be stated in a law or official policy pronouncement, e.g., Executive Order, Memorandum Circular, Administrative Order or any such official instrument to announce policy. Such a law or official policy statement should have a clear and unambiguous statement of the role, responsibilities, functions and various contractual obligations and provisions such as risk sharing, recovery of investments, contract variation, dispute settlement, arbitration and others of the parties involved in the BOT contract.

3. It is recommended that the BOT law should be considered the primary statute that establishes government policy and the institutional framework for implementing BOT. There should be accompanying implementing rules and regulations (IRR) of the BOT law that specify the administrative procedure for implementation. The IRR may be amended from time to time as the need arises. This will provide the government both the legal basis for the BOT approach (that is, a primary statute) as well as the flexibility (through the IRR) to respond to changing needs and circumstances of the economy, the financial markets, private investors and other stakeholders, that may impact on the efficient implementation of the BOT approach.

4. It is recommended that competitive bidding procedures remain the central tenet of government procurement policy. Competitive bidding provides the best prospects for efficient provision and implementation of the infrastructure project at the least possible cost to the economy. The BOT law should thus forthrightly express the government's

preference for competitive bidding and affirm that direct negotiation and unsolicited proposals remain the exception.

5. It is recommended to have a clear institutional framework for review and approval of BOT projects and contracts.

6. It is recommended that the BOT law should affirm the government's binding commitment to honor and defend contractual rights and obligations. This includes providing for greater transparency with regard to the content of contracts.

7. It is recommended that the government should build capacity for project design, technical analysis, contract review, monitoring the implementation of BOT infrastructure projects. It is also important to specify which government agency will be responsible for monitoring BOT projects at different stages of development, that is, from project entry, construction to implementation.

8. It is recommended that the government with assistance possibly from donors should establish a project preparation or development facility that could be tapped by government agencies for BOT project identification and the development of BOT proposals for tender or competitive bidding.

9. It is recommended that independent evaluation of the BOT project be made a regular activity of the government in order to assess whether or not it is delivering the envisaged development outputs.

10. It is recommended that the BOT law or official policy pronouncement should allow the private proponent to levy user charges that provide a return commensurate to the opportunity cost of its invested funds. This will ensure project viability and will reduce or minimize the amount of subsidy that government provides.

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Chapter 12: Geographical Simulation Model for ERIA: Predicting the Long-run Effects of Infrastructure Development Projects in East Asia

S. Kumagai, T. Gokan, I. Isono and S. Keola

1. INTRODUCTION

The economic integration in East Asia is expected to proceed steadily for the next few decades, although the realization of an East Asian Community (EAC) is still a long way to go. What will happen to East Asia as the economic integration goes deeper and deeper? An implication of spatial economics, or new economic geography (NEG) is that inter- and intraregional income-gap would be wider as various trade costs, including transport costs, tariffs or "service link costs," are lowered.

It is quite important to trace the historical changes in the disparity among regions for the future research on East Asian economic and social issues. In the European Union (EU), various researches on the relationship between economic integration and changes in the geographical structure of regional economy, especially the location of industries and income disparity, have been conducted extensively (Midelfart-Knarvik, Overman and Venables 2001; Midelfart-Knarvik, Overman Redding and Venables 2002).

In contrast, there is little or no comprehensive research on the geographical structure of the East Asian economy as meticulously as that on their EU counterpart. This is partly because there is no integrated geographical data set for East Asia at this point. That is why this study aims to focus on the geographical structure of the regional economy, mainly from the viewpoint of spatial economics, using a Geographical Simulation Model (GSM) developed by the authors.

The analysis using Geographical Simulation Model for the Economic Research Institute for ASEAN and East Asia infrastructure project (IDE/ERIA-GSM) is the first step of

ERIA's research on the relationship between economic integration and regional economy at subnational level. The GSM is designed to predict the effects of the regional economic integration, especially the development of transport infrastructure and reduction in "border costs", and fits very well in the ERIA infrastructure project.

2. OBJECTIVES

The analysis using IDE/ERIA-GSM has two major objectives. The first objective is to know the dynamics of the location of population and industries in East Asia for the long term. Although there are many analyses using macro-economic models to forecast the macro-economic indices in East Asia at the national level, there is no or little analysis using the models to forecast the economic development in East Asia at subnational level. In the era of regional economic integration, the economic analysis at the national level is not enough to provide useful information for regional economic cooperation.

The second objective is to analyze the impacts of specific infrastructure projects on the regional economy at subnational level. It is difficult to prioritize various infrastructure development projects without proper objective evaluation tools. The GSM was developed to provide such an objective evaluation tool for the policy recommendations on infrastructure development.

3. FEATURES OF THE SYSTEM

The IDE/ERIA-GSM covers the following eight countries and regions in the model (Figure 1).

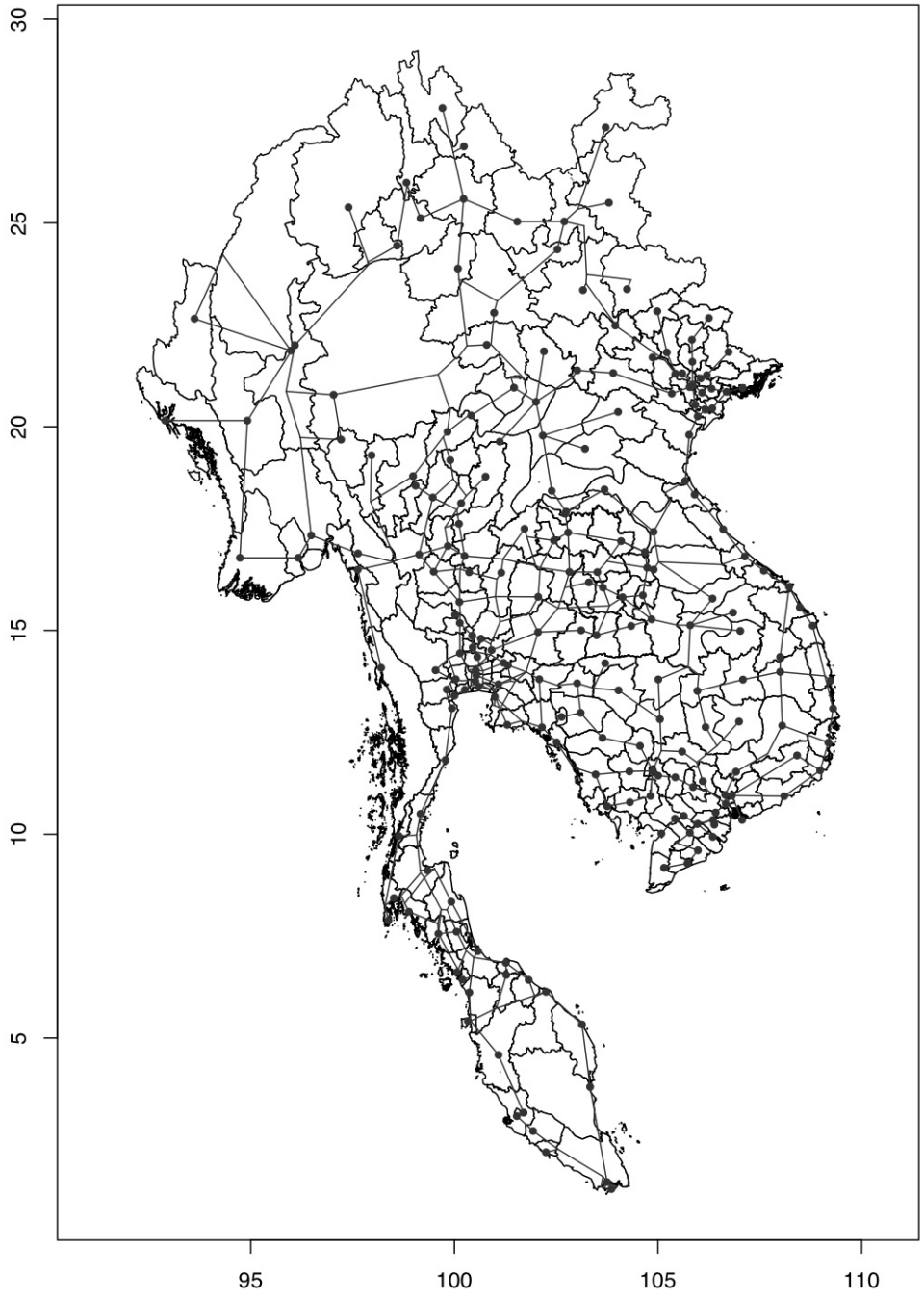
- Singapore
- Malaysia (Peninsular)
- Thailand
- Myanmar
- Cambodia
- Laos
- Vietnam
- Yunnan province of China

Here, these eight countries/regions shall be called the Continental South East Asia (CSEA). Each country/region is subdivided into states/provinces/divisions. Each state/province/division is represented by its capital city, and there are a total of 220 subnational regions. The following data are used on each subnational region:

- GDP by sector (primary, secondary and tertiary industries)
- Employee by sector (primary, secondary and tertiary industries)
- Longitude and latitude
- Area of arable land

About 457 routes between cities are involved, mainly based on the “Asian Highway” database of the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) . The actual road distance between cities is used; if road distance is not available, slant distance is employed.

Figure 1: The Map of Continental South East Asia



4. EXPLANATION OF THE MODEL

The IDE/ERIA-GSM is able to forecast the dynamics of population and industries at the subnational level. It works as follows:

1. Load initial data

   The data on regions and routes are loaded from prepared CSV files. The regional data and the routes data between them should be compatible. For instance, all the names of cities on the routes data should appear in the regional data, together with other attributions of the city (region), especially the latitude and longitude.

2. Find short-run equilibrium

   The IDE/ERIA-GSM calculates the short-run equilibrium values of the GDP by sector, the employment by sector, the nominal wage by sector, the price index and so on, based on the distribution of population. The IDE/ERIA-GSM uses the iteration technique to solve the multi-equation model.

3. Population Dynamics

   Once the short-run equilibrium values are found, IDE/ERIA-GSM calculates the dynamics of the population or the movement of labor, based on the differences in the real wages between countries/regions/industries. The IDE/ERIA-GSM is able to set the speed of adjustment differently for inter-country/inter-region/inter-industry labor movement.

4. Output Results

   To examine the related variables in time series, IDE/ERIA-GSM exports the equilibrium values of the GDP by sector, the employment by sector, the nominal wage by sector, the price index, and so on, for every single year in CSV and XML formats. These can be checked using Google™ map or a statistical language.

5. Back to 2.

   Now, back to (2), find the short-run equilibrium, and the time in the simulation moves one year forward. In the analyses in this chapter, the simulation is ran for 20 years.

5. SCENARIOS AND RESULTS

5.1. Scenarios of the simulation

Four scenarios were set to see the effects of East West Economic Corridor (EWEC) but first, the following section explains two of these: the baseline scenario and the fully developed EWEC scenario.

5.1.1. Maintained assumptions

Several macroeconomic and demographic parameters were held constant and only logistic settings by scenario were changed. The following macro parameters are maintained across scenarios:

- GDP per capita of each country is assumed to increase by the average rate for the year 2000-2005, other things being equal[1];
- National population of each country is assumed to increase by the rate forecasted by the United Nations Population Fund (UNFPA) until year 2025;
- There is no immigration between CSEA and the rest of the world.

5.1.2. Base-line scenario

The assumptions in this scenario are as follows:

- The Asian Highway networks all exist and cars can run on it at 40km/h.

[1] The growth rate of GDP per capita in each city is likely to differ from the national average for various reasons, and actually so in the simulation.

- The border costs, or the times required for custom clearance are as follows:

Singapore – Malaysia	2.0 hours
Malaysia – Thailand	8.0 hours
All other national borders	24.0 hours

5.1.3. Fully-developed East West Economic Corridor

The assumptions in this scenario are as follows:

- Cars can run on the EWEC at 80 km/h, and on other Asian Highway at 40km/h;
- There is no border control along EWEC (taking 0.0 hour for crossing national borders).

5.2. Results of the simulation[2]

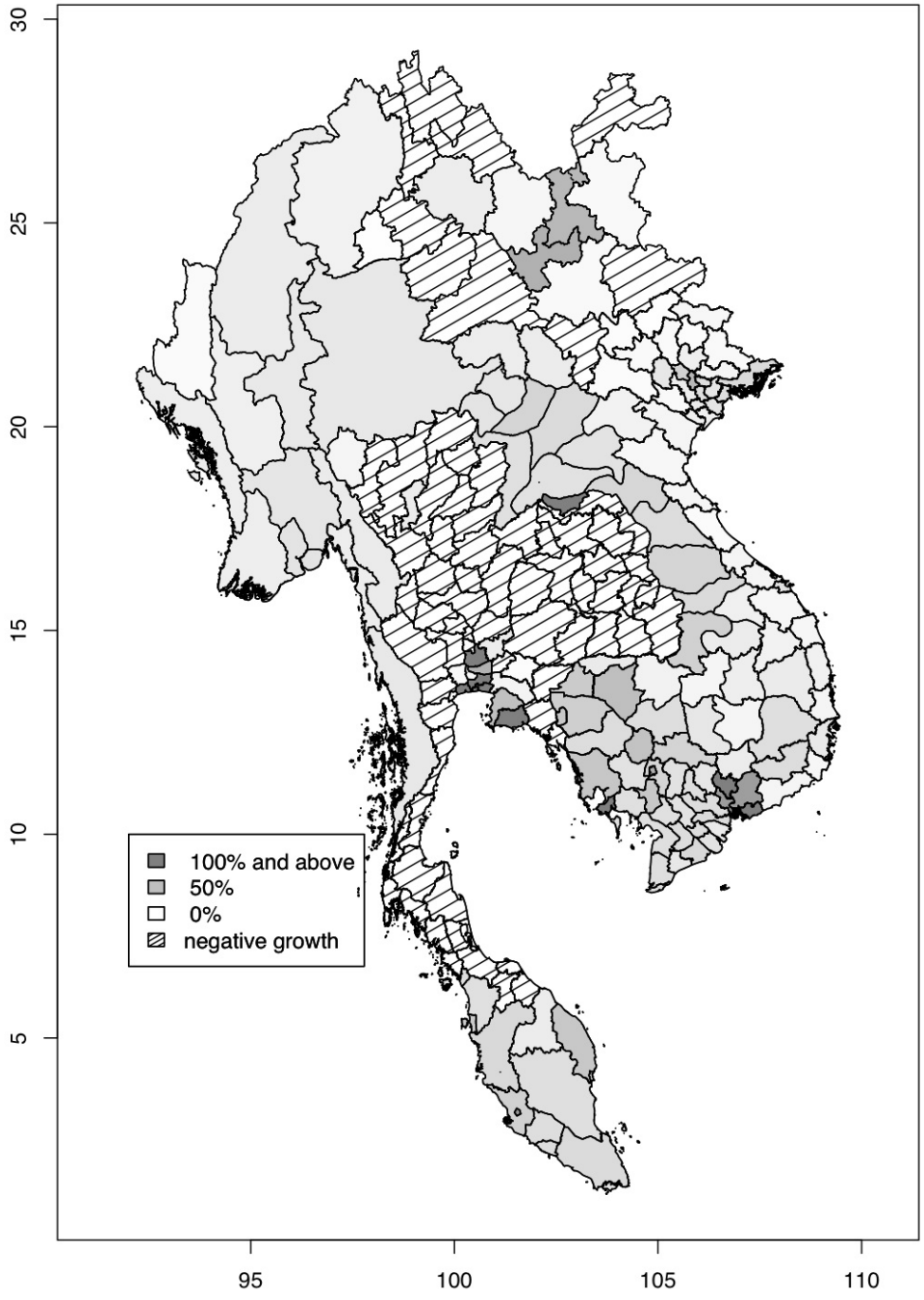
5.2.1. Baseline scenario

Figure 2 shows the population changes from 2005 to 2025 under the baseline scenario. One can see a clear trend in the agglomeration of population. There are a few regions gaining population, such as the regions surrounding Bangkok, those surrounding Ho Chi-Minh, and those surrounding Kunming as well as Vientiane.

On the other hand, some regions are losing their population such as regions in Thailand except those around Bangkok. Thailand seems to be a *monocentric* country in 2025.

[2] GSM is now under development and various parameters shoule be caribrated carefully. So, here we state that the absolute values in the population and GDP forecast are rough calculation, and reliability is rather low. On the other hand, some qualitative results or "tendency" revlead by the simulation are quite robust for the wide range of the parameters, having high reliability.

Figure 2: Population Changes (2005-2025), Baseline Scenario



Source: IDE/ERIA-GSM estimation.

Table 1 shows the population of the top 10 largest regions of CSEA in 2025. Bangkok has the largest population of 13 million[3], followed by Ho Chi-Minh (9.5 million) and Mandalay (8.0 million). Note that this is not the population of each city but that of the region[4].

Table 1: Population of Top 10 Largest Regions (2025)

Rank	Region	Country	Population(thousand) 2005	2025	Change
1	Bangkok Metropolis	Thailand	6,477	13,037	2.01
2	Ho Chi Minh	Vietnam	5,338	9,464	1.77
3	Mandalay	Myanmar	6,821	7,997	1.17
4	Ayeyarwady	Myanmar	7,034	7,981	1.13
5	Kunming Shi	Yunnan	4,933	7,622	1.55
6	Yangon	Myanmar	5,769	6,979	1.21
7	Sagaing	Myanmar	5,694	6,564	1.15
8	Bago	Myanmar	5,290	6,347	1.20
9	Selangor	Malaysia	4,491	6,090	1.36
10	Shan	Myanmar	5,033	5,937	1.18

Source: IDE/ERIA-GSM estimation.

Table 2 shows the GDP of the top 10 largest regions of CSEA in 2025. Bangkok is estimated to have the biggest economy by 2025, surpassing Singapore. The second biggest economy is Singapore, and Rayong of Thailand comes in third.

The baseline simulation shows that principal cities gains more population, i.e., "core-periphery" structure appears in most of the CSEA countries. Among them, the periphery of Thailand and Yunnan province is expected to lose their population, and intra-country/provintial disparity would be a severe problem.

[3] GSM doesn't consider the congestion in roads, and the limitation in real-estate for business and housing. These factors might lower the actual population of Bangkok in 2025 than that forecasted.

[4] There are seven regions of Myanmar in the top 20 list. This is partly because the administrative district in Myanmar is larger compared with other Continental South East Asia Region (CSEA) countries. That is why unified territorial units for geographical statistics is indispensable to conduct this kind of international comparison properly.

Table 2: GDP of Top 10 Largest Regions (2025)

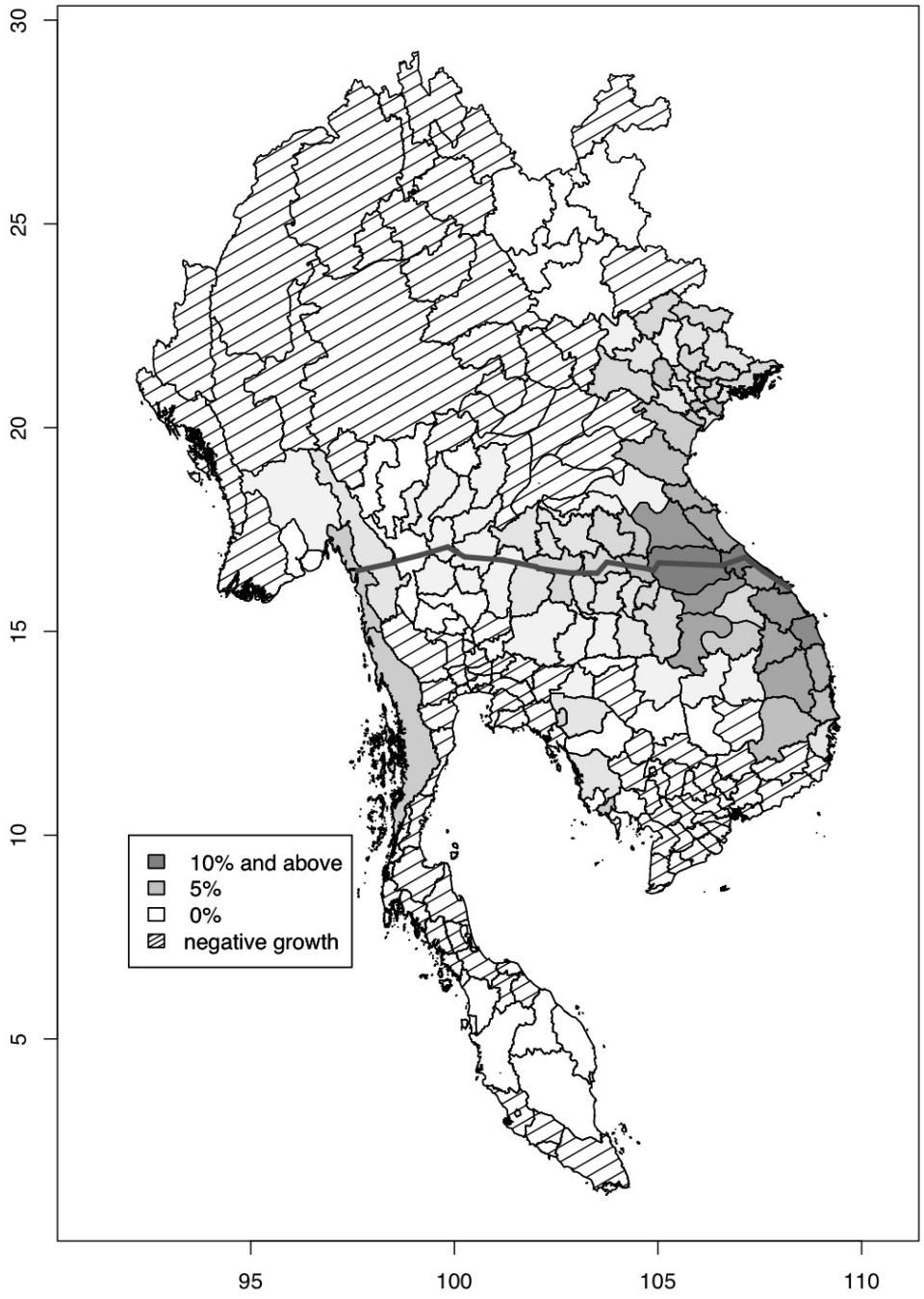
Rank	Region	Country	GDP(million USD) 2005	GDP(million USD) 2025	Change
1	Bangkok Metropolis	Thailand	48,333	287,147	5.94
2	Singapore	Singapore	105,141	180,124	1.71
3	Rayong	Thailand	7,184	55,854	7.77
4	Samut Prakan	Thailand	10,020	54,095	5.40
5	Selangor	Malaysia	20,203	51,238	2.54
6	Kuala Lumpur	Malaysia	11,735	40,396	3.44
7	Kunming Shi	Yunnan	8,865	39,060	4.41
8	Samut Sakhon	Thailand	4,635	36,721	7.92
9	Chon Buri	Thailand	6,837	28,056	4.10
10	Phra Nakhon Si Ayutthaya	Thailand	5,491	27,978	5.10

Source: IDE/ERIA-GSM estimation.

5.2.2. Fully-developed East West Economic Corridor

In this part of the study, one can see the effects of the fully-developed EWEC (both physical infrastructure and custom facilitation at the borders). Figure 3 shows the differences in population at 2025 between this scenario and the baseline scenario, and Table 3 shows the top 10 gainers in population in this scenario against the baseline. The top gainer in population is Savannakhet, gaining 15.8 percent, compared with the baseline. The regions in Laos and Vietnam occupy the rest of the list.

Figure 3: Population Difference (2025). EWEC vs. Baseline



Source: IDE/ERIA-GSM estimation.

Table 3: Top 10 Gainers in Population by EWEC (2025)

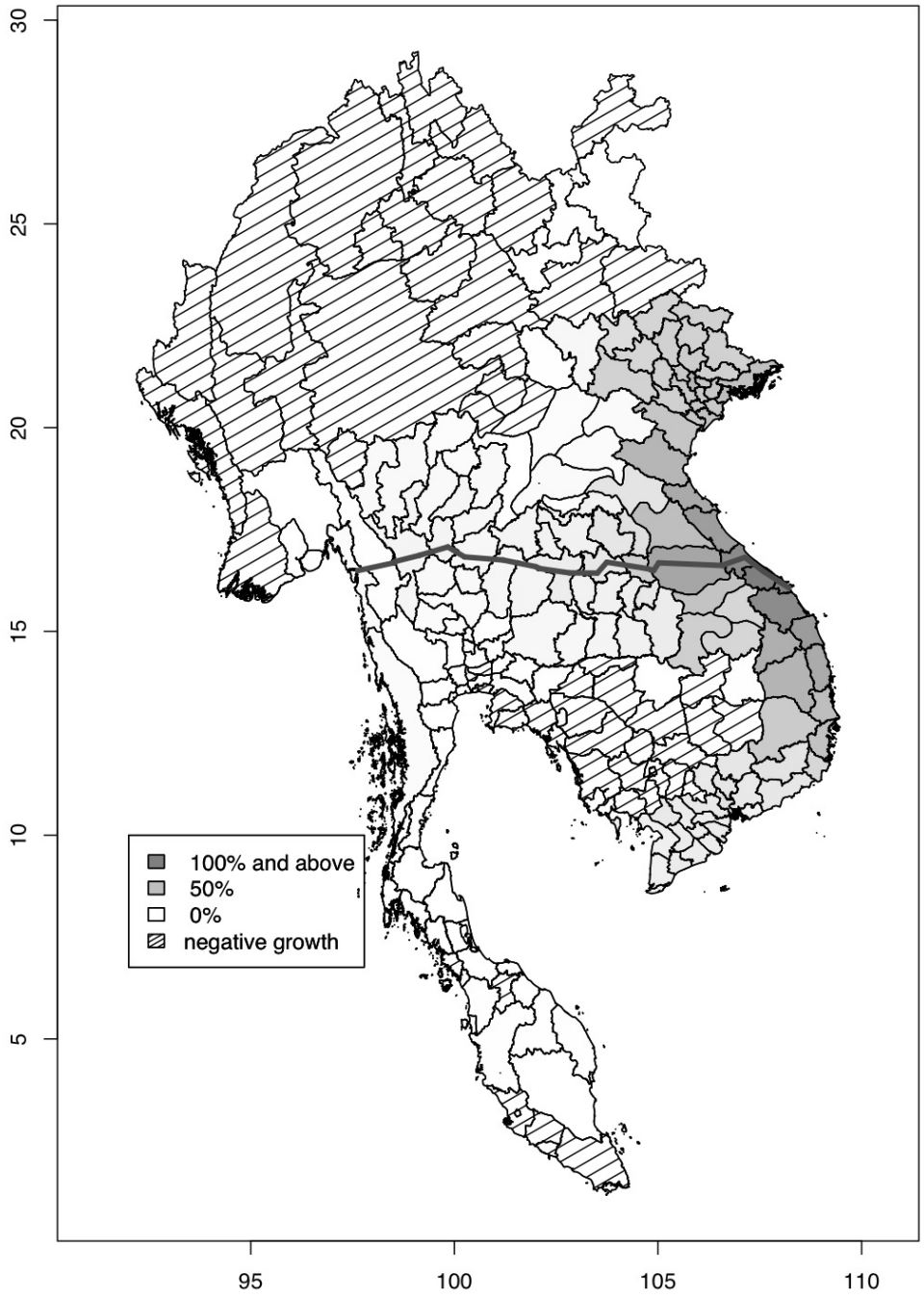
Rank	Region	Country	Population(thousand)		Gain
			baseline	EWEC	
1	Savannakhet	Laos	1,190	1,379	15.8%
2	Da Nang	Vietnam	891	984	10.5%
3	Quang Tri	Vietnam	655	719	9.8%
4	Quang Ngai	Vietnam	1,346	1,464	8.8%
5	Saravan	Laos	448	486	8.5%
6	Khammouan	Laos	462	501	8.4%
7	Quang Nam	Vietnam	1,545	1,663	7.6%
8	Thua Thien-Hue	Vietnam	1,192	1,280	7.4%
9	Quang Binh	Vietnam	871	934	7.3%
10	Gia Lai	Vietnam	1,192	1,277	7.1%

Source: IDE/ERIA-GSM estimation.

Figure 4 shows the differences in GDP by 2025 between this scenario and the baseline scenario, and Table 4 lists the top 10 gainers in GDP for this scenario as against the baseline. The top gainer in GDP is Da Nang, at 135 percent, compared with the baseline, which is surprising[5]. The EWEC almost doubles the GDP of Da Nang.

[5] Note that GDPs are nominal, and equated in US dollars.

Figure 4: GDP Difference (2025). EWEC vs. Baseline



Source: IDE/ERIA-GSM estimation.

Table 4: Top 10 Gainers in GDP by EWEC (2025)

Rank	Region	Country	GDP(mil. USD)		Gain
			baseline	EWEC	
1	Da Nang	Vietnam	827	1,939	134.5%
2	Thua Thien-Hue	Vietnam	592	1,264	113.5%
3	Quang Nam	Vietnam	752	1,431	90.4%
4	Quang Tri	Vietnam	357	677	89.6%
5	Quang Ngai	Vietnam	713	1,273	78.4%
6	Quang Binh	Vietnam	347	611	76.2%
7	Savannakhet	Laos	2,169	3,694	70.3%
8	Ha Tinh	Vietnam	722	1,204	66.9%
9	Binh Dinh	Vietnam	1,136	1,887	66.2%
10	Kon Tum	Vietnam	247	402	63.0%

Source: IDE/ERIA-GSM estimation.

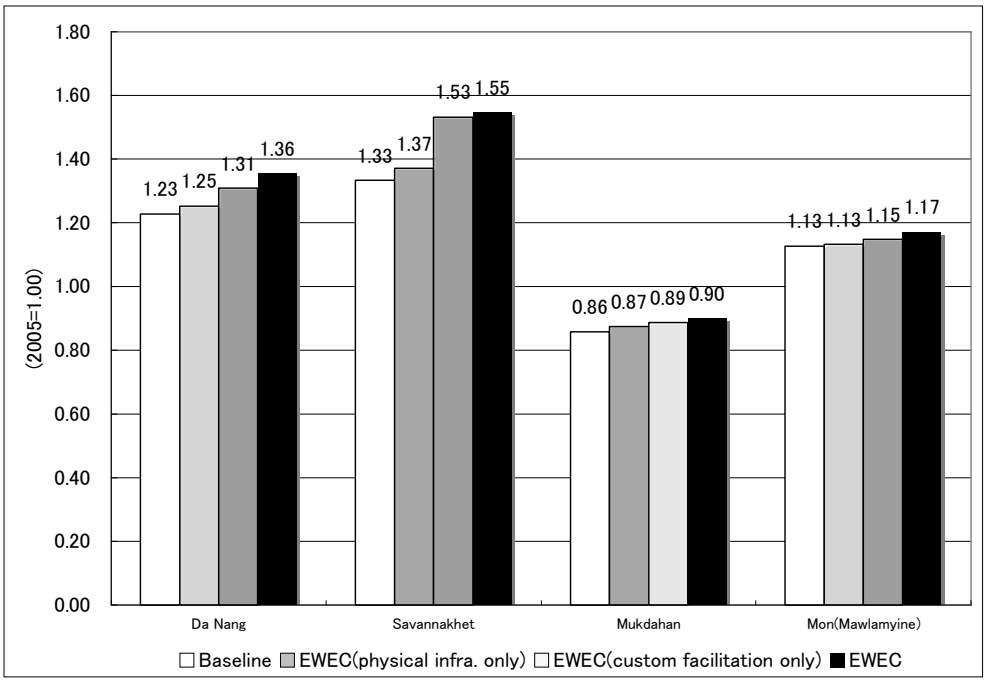
The EWEC mainly benefits the regions in Southern Laos, Central Vietnam and Northen Thailand.However, some regions are not benefited from EWEC. It is understandble that the population in Northen Laos and Southern Vietnam decline slightly due to the EWEC. Because the international immigration is prohibited in the simulation, population gained in one site means such population came from somewhere else in the same country. On the other hand, it is quite interesting to know that some regions away form the EWEC lose their GDP due to the EWEC, compared with the baseline scenario. This result shows one of the important characteristics of the model based on spatial economics.

5.3. Scenarios to check the effects of "border costs" and their results

This study also tested the two intermediate scenarios: These are EWEC (physical infrastructure only) and EWEC (custom facilitation at borders only)[6]. Figures 5 and 6 show the gains in population and GDP by scenario for selected regions along EWEC.

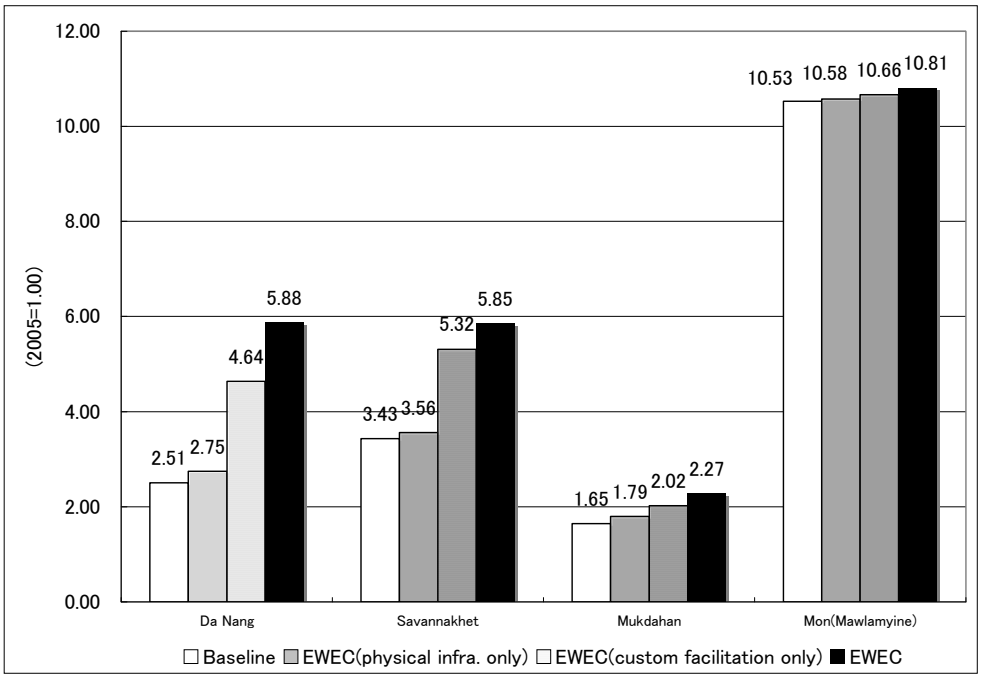
[6] The former scenario is that (1) they can run on EWEC at 80 km/h, and on other Asian Highway at 40km/h; and (2) The border costs, or the times required for custom clearance, are the same as the baseline scenario. The latter scenario is that (1) the Asian Highway networks all exist, and cars can run on it at 40km/h; and (2) there is no border control along EWEC.

Figure 5: Gains in Population by Scenario for Selected Regions (2025)



Source: IDE/ERIA-GSM estimation.

Figure 6: Gains in GDP by Scenario for Selected Regions (2025)



Source: IDE/ERIA-GSM estimation.

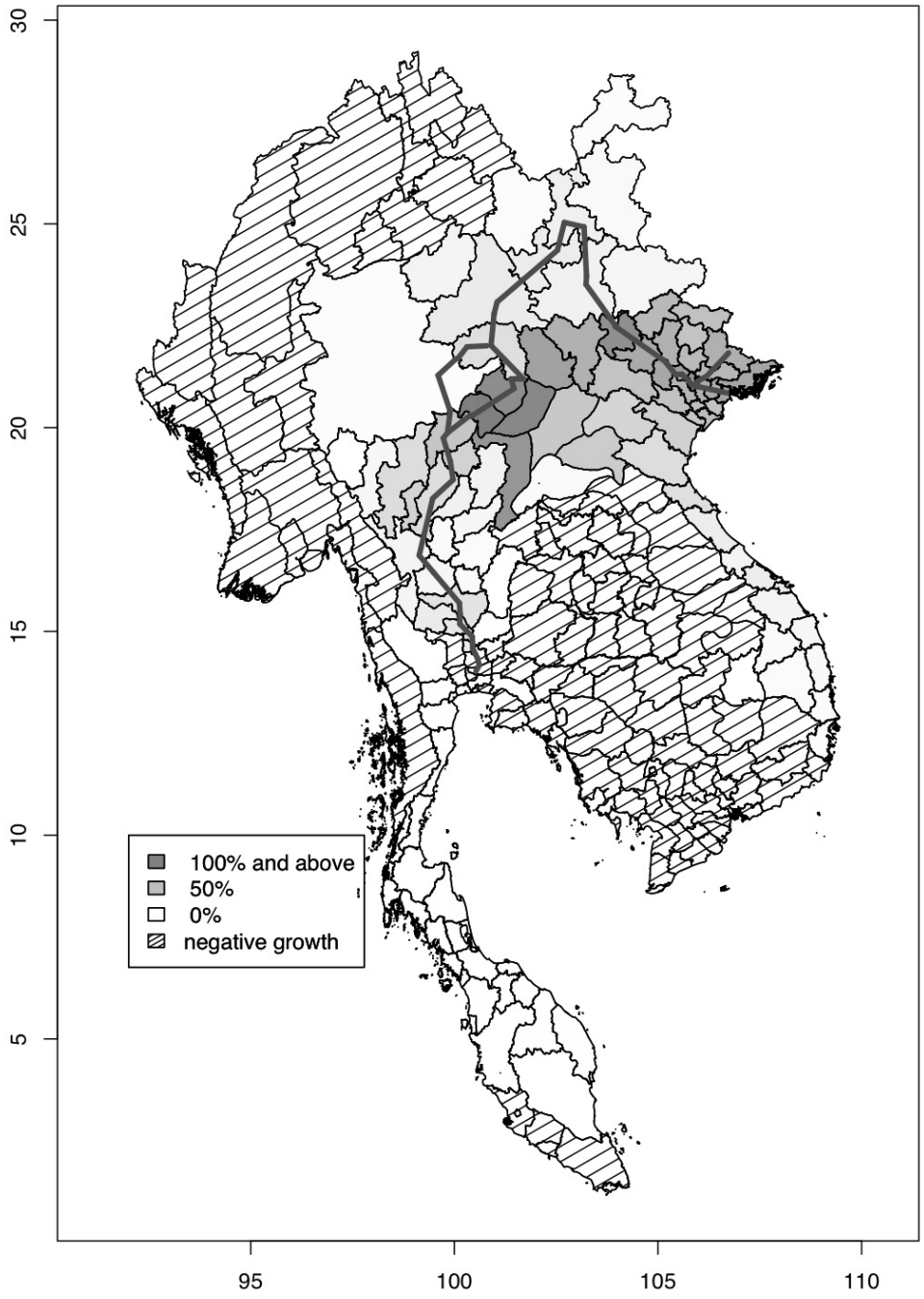
In terms of population, the EWEC (both physical infrastructure and custom facilitation) brings up Savannakhet's population to 1.55 times in 2025 compared with that in 2005. However, this increase is reduced to 1.37 times if only the physical infrastructure is constructed while there is no change in custom clearance. This is not much different from the 1.33 times for the baseline scenario.

As for GDP, EWEC (both physical infrastructure and custom facilitation) increases Savannakhet's GDP 5.85 times in 2025 compared with that in 2005. On the other hand, EWEC (physical infrastructure only) increases the GDP 3.56 times, which again is not much different from the 3.43 times for the baseline scenario.

5.4. Comparison to other economics corridor

This study further did a quick check on the economic effects of other economics corridors. Figures 7 and 8 show the changes in GDP against the baseline for the North South Economic Corridor (NSEC) and Southern Economic Corridor (SEC). It is obvious that NSEC benefits Northern Vietnam, Northern Laos and the southern part of the Yunnan province. On the other hand, SEC benefits most of the Cambodian regions and Southern Vietnam. The EWEC, NSEC and SEC seem to be highly complementary projects.

Figure 7: GDP Difference (2025). NSEC vs. Baseline



Source: IDE/ERIA-GSM estimation.

Figure 8: GDP Difference (2025). SEC vs. Baseline

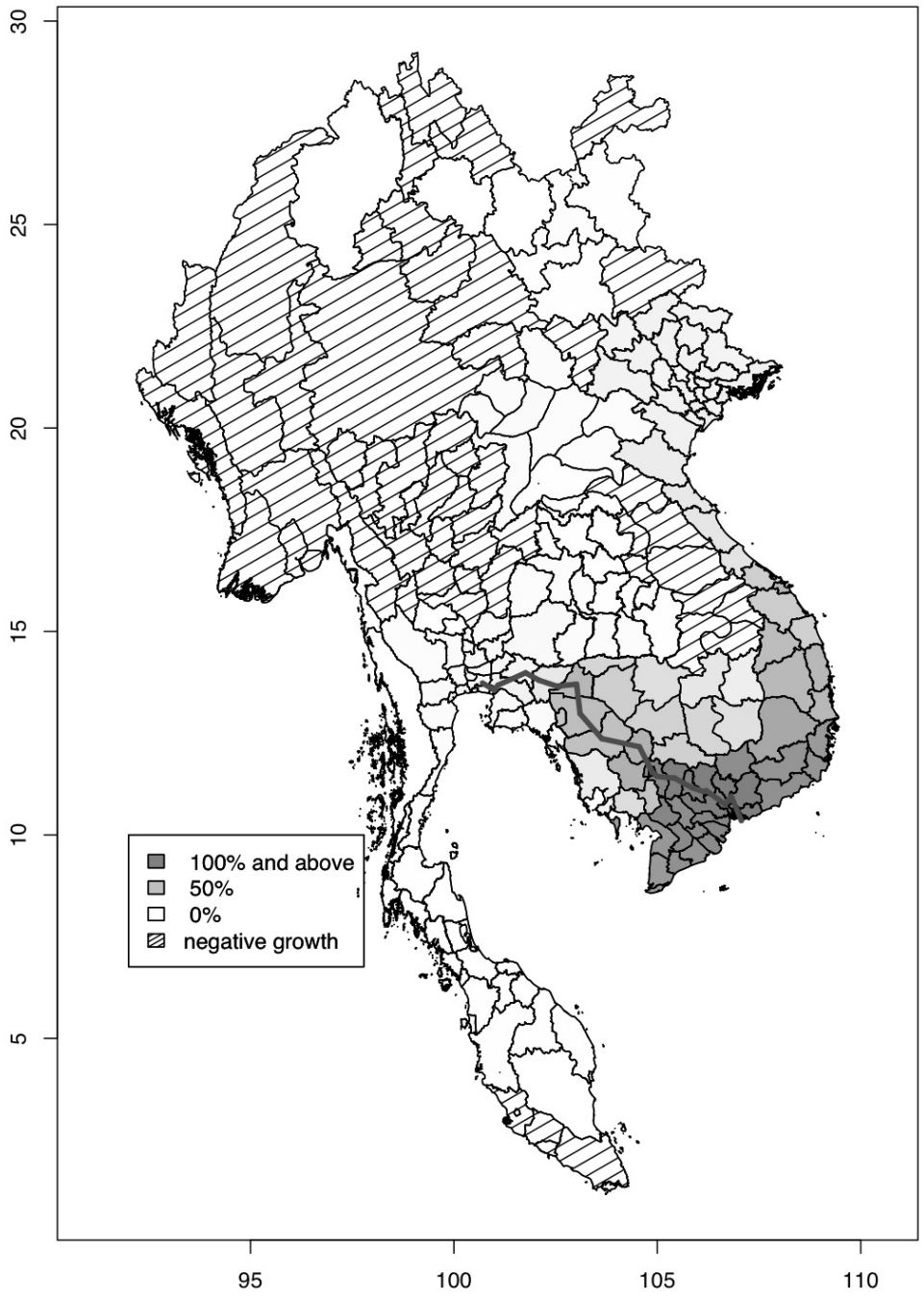


Table 5: Top 10 Gainers in GDP by NSEC (2025)

Rank	Region	Country	GDP(mil. USD)		Gain
			baseline	NSEC	
1	Bokeo	Laos	268	619	131.4%
2	Oudomxai	Laos	488	943	93.2%
3	Louang Namtha	Laos	219	414	89.4%
4	Lao Cai	Vietnam	256	478	86.7%
5	Xaignabouri	Laos	706	1,285	81.9%
6	Hanoi	Vietnam	6,250	11,317	81.1%
7	Vinh Phuc	Vietnam	2,019	3,569	76.8%
8	Phongsali	Laos	211	365	73.1%
9	Haiphong	Vietnam	2,368	4,039	70.6%
10	Quang Ninh	Vietnam	1,640	2,769	68.8%

Source: IDE/ERIA-GSM estimation.

Table 6: Top 10 Gainers in GDP by SEC (2025)

Rank	Region	Country	GDP(mil. USD)		Gain
			baseline	SEC	
1	Svay Rieng	Cambodia	281	1,190	323.98%
2	Prey Veng	Cambodia	485	1,460	201.14%
3	Ba Ria-Vung Tau	Vietnam	27,710	73,179	164.09%
4	Phnom Penh	Cambodia	2,576	6,232	141.96%
5	Tay Ninh	Vietnam	1,207	2,855	136.64%
6	Ho Chi Minh	Vietnam	26,417	62,408	136.25%
7	Binh Duong	Vietnam	6,046	13,912	130.09%
8	Dong Nai	Vietnam	11,900	25,067	110.64%
9	Long An	Vietnam	2,360	4,761	101.73%
10	Ben Tre	Vietnam	1,444	2,816	95.02%

Source: IDE/ERIA-GSM estimation.

Figure 9 shows economic effects of the case where all the economic corridors are developed together. Surprisingly, most of the regions in the Greater Mekong Subregion, except for Myanmar, benefited from the development

Figure 9: GDP Difference (2025). All GMS Economic Corridors vs. Baseline

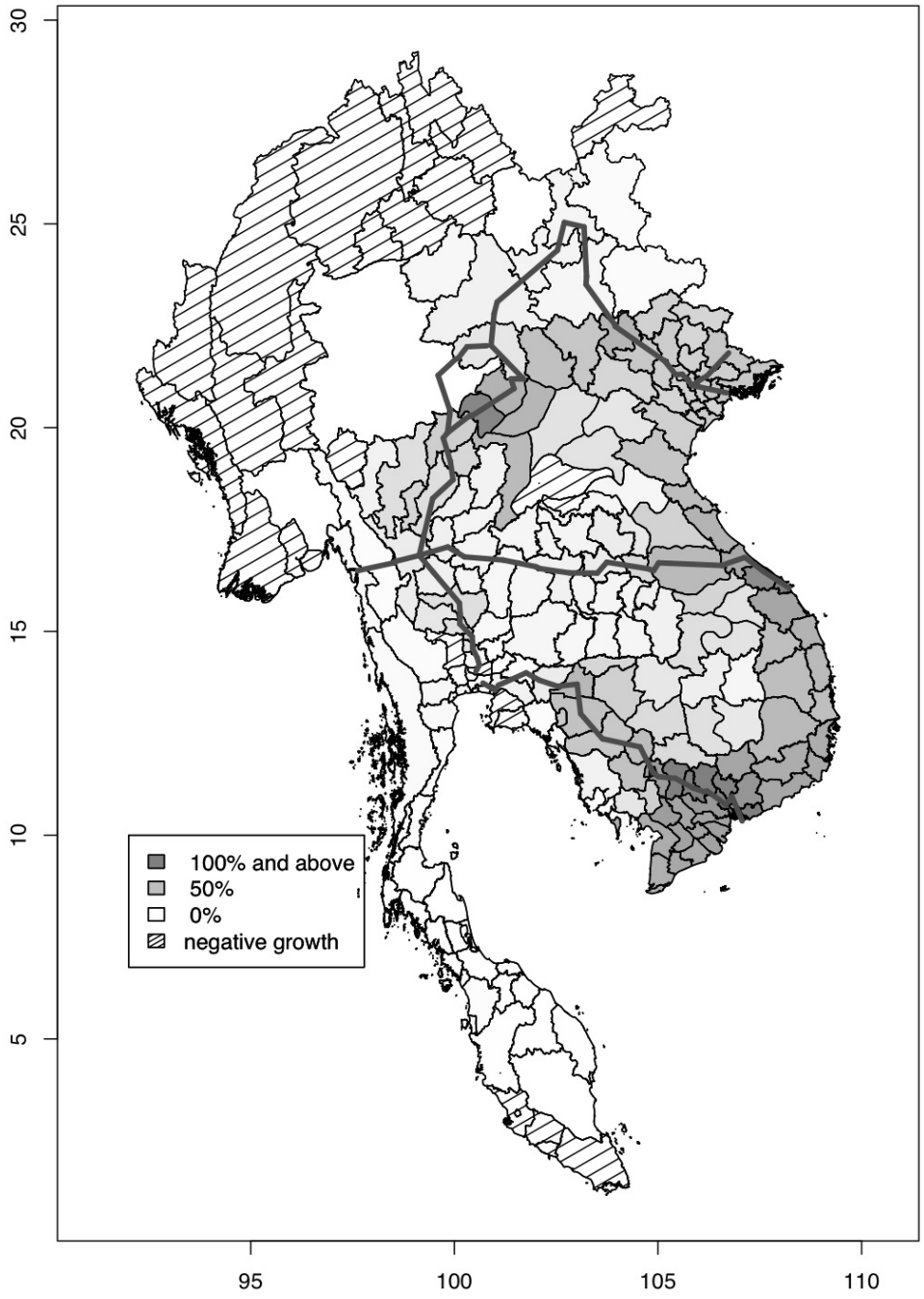


Table 7: Top 5 Gainers in GDP by All GMS Corridors in Each Country (2025)

Cambodia				
Rank	Region	GDP(mil. USD) baseline	GDP(mil. USD) All GMS	Gain
1	Svay Rieng	281	1,068	280.5%
2	Prey Veng	485	1,317	171.5%
3	Phnom Penh	2,576	5,603	117.5%
4	Kandal	785	1,387	76.6%
5	Banteay Meanchey	664	1,037	56.1%

Yunnan Province of China				
Rank	Region	GDP(mil. USD) baseline	GDP(mil. USD) All GMS	Gain
1	Xishuangbanna Daizu Zizhizhou	2,523	3,023	19.8%
2	Simao Diqu	2,553	2,829	10.8%
3	Yuxi Diqu	19,927	21,817	9.5%
4	Kunming Shi	39,060	42,002	7.5%
5	Honghe Ha'nizu	7,244	7,718	6.5%

Laos				
Rank	Region	GDP(mil. USD) baseline	GDP(mil. USD) All GMS	Gain
1	Bokeo	268	520	94.1%
2	Louang Namtha	219	351	60.4%
3	Oudomxai	488	768	57.4%
4	Savannakhet	2,169	3,346	54.2%
5	Xaignabouri	706	1,078	52.6%

Thailand				
Rank	Region	GDP(mil. USD) baseline	GDP(mil. USD) All GMS	Gain
1	Chiang Rai	1,522	2,093	37.5%
2	Sing Buri	713	936	31.3%
3	Lamphun	2,730	3,583	31.2%
4	Phayao	638	837	31.2%
5	Mukdahan	401	519	29.4%

Myanmar				
Rank	Region	GDP(mil. USD) baseline	GDP(mil. USD) All GMS	Gain
1	Tanintharyi	2,410	2,512	4.2%
2	Mon	3,251	3,375	3.8%
3	Kayin	2,143	2,178	1.7%
4	Shan	7,246	7,255	0.1%
5	Bago	7,942	7,947	0.1%

Malaysia				
Rank	Region	GDP(mil. USD) baseline	GDP(mil. USD) All GMS	Gain
1	Perlis	1,389	1,418	2.1%
2	Kedah	10,173	10,380	2.0%
3	Pulau Pinang	15,718	16,018	1.9%
4	Terengganu	12,951	13,102	1.2%
5	Kelantan	5,129	5,183	1.0%

Vietnam				
Rank	Region	GDP(mil. USD) baseline	GDP(mil. USD) All GMS	Gain
1	Ba Ria-Vung Tau	27,710	59,414	114.4%
2	Tay Ninh	1,207	2,541	110.6%
3	Ho Chi Minh	26,417	53,572	102.8%
4	Da Nang	827	1,659	100.6%
5	Binh Duong	6,046	11,804	95.2%

Singapore				
Rank	Region	GDP(mil. USD) baseline	GDP(mil. USD) All GMS	Gain
1	Singapore	180,124	179,323	-0.4%

Source: IDE/ERIA-GSM estimation.

6. CONCLUSIONS AND POLICY RECOMMENDATIONS

6.1. The findings

6.1.1. Border costs play a big role

The first important finding is that border costs play a big role in the location of populations and industries. As shown in the previous section, physical infrastructure alone is not enough to capitalize on its advantages.

It is obvious that border costs are obstacles to the development of the regions. Physical infrastructure such as road and railways are not enough to assist in the development of the regions. In the simulations, the elimination of border costs seems to be much more effective than physical infrastructure development.

6.1.2. Nominal Wage matters more than expected

The second finding is that the difference in nominal wage is an important determinant of agglomeration. In CSEA, there is quite a large difference in nominal wage not only internationally but intranationally as well. It is so large that small locational advantages could not overturn the centripetal force caused by higher nominal wage of some central regions, which induce the inflow of population.

According to the study, Bangkok and its satellite regions, Ho Chi-Minh and its satellite regions, Kuala Lumpur and Selangor, Vientiane and Kunming are regions that provide higher nominal wage than the national average, and most of these have location advantages, too. Bangkok should be noted as a robust “core” region, having both higher nominal wage and locational advantages.

However, the importance of initial difference in nominal wage does not mean that spatial economics does not matter at all. On the contrary, infrastructure development has the power to amend the regional inequality caused by the initial difference in nominal

wage in some extent. As shown in the previous section, EWEC tends to draw population from the Bangkok metropolis to Northern Thailand, and diverse population from Vientiane to Savannakhet.

6.2. Policy implications

6.2.1. Further accumulation of sub-national statistics

Although this study has proposed the analyses using IDE/ERIA-GSM and showed its potential, it is only a starting point and there are two main issues to be addressed.

First, one needs to collect more precise regional economic and demographic data at the subnational level in each country. More precisely, the establishment of uniform territorial units for geographical statistics for East Asia is crucial. Without the uniform territorial units, one could not compare various statistics directly across countries. For instance, it is not proper to compare the concentration of population at "state" level in Malaysia versus at "provincial" level in China. In Europe, Eurostat established the Nomenclature of Territorial Units for Statistics (NUTS) more than 25 years ago. The NUTS enables geographical analysis and formation of regional policies based on a single uniform breakdown of territorial units for regional statistics. In this regard, there ought to be an East Asian counterpart of NUTS as well (Call it EA-NUTS here). Based on EA-NUTS, basic social and economic information, such as population, GDP, industrial structure and employment by sector for each subregion should be collected or re-compiled from existing data sets from statistical departments of member countries.

Second, one needs to collect more precise data on routes and infrastructure connecting regions. Information on the main routes between regions such as distance, time distance, topology and mode of transport (road, railway, sea and air) is also indispensable. One also needs the data on the "border costs" such as tariffs and time-cost caused by inefficient customs clearance. It might be necessary to measure and continuously update the information on routes and border costs by experimental distribution of goods and actual drive, such as one study from JETRO (2007).

6.2.2. Reduction in border costs

While various logistic infrastructure connecting East Asian countries are now under construction, simulations suggest that just connecting regions by highways is not enough to facilitate the international trade of goods. Actually, subcontracting one manufacturing process internationally requires crossing national borders four times at least, and incurring various overhead costs such as explicit costs (e.g., tariffs) and implicit costs (e.g., time wasted during customs checks at the borders). One of the important implications of IDE/ERIA-GSM is that such border costs affect the geographical distribution of population and industries more than expected.

A possible measure to reduce these "border costs" is the introduction of East Asian Common Radio Frequency Identification (RFID) System for Logistics. The RFID has a similar function as barcodes but can be read without touching it. Thus, it is possible to read multiple RFIDs at once and to check contents of cargoes without opening them. This system is expected to reduce the lead-time and improve the traceability of the international transaction dramatically, contributing to further develop effective "fragmentation" of production processes.

6.2.3. Establishment an international body of planning and coordination for infrastructure development

This study realizes that the EWEC, NSEC and SEC are highly complementary projects. By implementing all three, most of the regions in the Greater Mekong Subregion benefit from the development. However, one exception is Myanmar. Although a few regions in Myanmar benefit from these economic corridors, the degree of the benefit is not much, and the rest of its regions do not benefit at all.

This study does not mean to be pesimistic toward Myanmar's economic development. On the contrary, Myanmar is found to have a naturally high potentional of economic

growth in the baseline scenario. However, to enhance the economic development of Myanmar further, some plan on an economic corridor for Myanmar is needed, too.

As mentioned above, some coordination is required to plan and implement the infrastructure development in CSEA. So, it is highly desireable to set up an international body for planning and cordination of infrastructure development in East Asian counties.

APPENDIX A: BRIEF EXPLANATION ON SPATIAL ECONOMICS

Spatial economics explains the spread of economic activities within a general equilibrium framework. The main ingredients of the spatial economics are (1) increasing returns; (2) imperfect competition; (3) love of variety; and (4) endogenous agglomeration forces. With increasing returns in production activity, firms can enjoy externalities as explained by A. Marshall (1890, 1920). Imperfect competition avoids backyard capitalism implied in the spatial impossibility theorem. That is, imperfect competition (monopolistic competition) guarantees the demand for goods even if transport costs are incurred. Furthermore, love for variety implies that a large variety of consumption goods improves consumers' welfare as explained by Haig (1926) and a large variety of input improves firms' productivity. Such love for variety demands any goods produced in distant markets. With regard to endogenous agglomeration forces, economic activities agglomerate as a consequence of exogenous uneven distribution of resources or as a consequence of the economic activities themselves. Do call the former "first nature" and the latter "second nature". The spatial economics mainly focuses on the second nature, although the following simulation models adopt both the first nature and second nature.

The distribution of economic activities is decided by the balance of *agglomeration forces* against *dispersion forces*. There are many types of agglomeration and dispersion forces. Therefore, the observed spatial configurations of economic activities have varieties. With exogenous shocks, the spatial structure is organized by itself and the core-periphery structure evolves through structural changes.

The endogenous agglomeration forces bring circular causality. Circular causality is formed by market-access effects and cost-of-living effects. In terms of market-access effects, concentration (or an increase in demand by immigrants) enlarges the market. Suppliers locating in a large market can sell more since goods that are not transported between regions are cheaper. Obviously, this effect becomes weak when transport costs are low. More importantly, under the increasing-returns-to-scale production technology, the increase in the number of suppliers in a larger market is more than proportional to

the expansion of the home market. As a result, the excess goods over local demand are exported.

The second force causing a concentration is cost-of-living effects. The price index of goods becomes lower in a region where many suppliers gather. As goods are produced locally, the prices of a large share of such goods do not include transport costs. This allows prices of goods to remain low, which then induces more demand in the region.

This effect works better when transport costs are high and the mill price is low. The market-access effects and cost-of-living effects reinforce each other. Because the former lures supply and the latter attracts demand, these two effects form a circular causality in which economic activities agglomerate in a region. That is, an increase in either upstream or downstream firms encourages further increase in the other type of firms in the region, as explained by Hirschman (1958). For this same reason, an increase in either consumer or producer provides the incentive for the other to agglomerate in the region.

On the other hand, Krugman (1991) uses market crowding effects as the dispersion force. Because of the decrease in the general price index due to concentration, the price charged by a specific firm becomes relatively high, resulting in lower demand for the goods. This effect becomes weaker as transport costs decrease.

Summing up these three effects, Krugman (1991) shows that the symmetric structure is maintained when transport costs are high enough, whereas core-periphery structure emerges when transport costs are low enough. In the formalization, transport costs between regions are exogenous factors and express all distance resistance. Mobile workers choose a preference between regions based on wage rates and prices in both regions. When transport costs are large enough, the dispersion force overcomes the agglomeration forces. Firms could not afford to play harsh price competition even in a slightly larger market because the profit from the distant market is small. Thus, economic activities disperse. On the other hand, as transport costs decrease enough, agglomeration forces surpass the dispersion force. Firms could enjoy large markets and

low procurement cost even with harsh price competition by locating in a large market. This is because the profits from distant market are large. Therefore, economic activities agglomerate in a region.

By introducing another dispersion force (such as land use and the agricultural good) with positive transport costs, economic activities may disperse even if the transport costs are extremely low.

Consequently, to derive a policy implication for a circumstance, one may need to consider more realistic settings. Furthermore, the interaction here can be followed, in a situation where the economy consists of two or three regions in literatures. For an economy with more regions, the usage of a computer in the study becomes more crucial.

Appendix B: DETAILS OF THE MODEL

B-1 Nominal Wage in Agriculture Sector

Production function for Agricultural sector is $f_A(r) = A_A(r)L_A(r)^{\alpha}F(r)^{1-\alpha}$, where $A_A(r)$ is the efficiency of produciton at location *r*, $L_A(r)$ is the labour input and $F(r)$ is the area of arable land at location *r*. α is labor input share. So, the nominal wage of the sector is expressed as follows:

$$w_A(r) = A_A(r)\alpha(\frac{F(r)}{L_A(r)})^{1-\alpha} \tag{1}$$

B-2 GDP

Firms set the price of the manufacturing goods as $p_M(r) = w_M(r)^{\beta}G_M(r)^{1-\beta}$, where $w_M(r)$ is the nomianl wage of the manufacturing sector at location *r*, and $G_M(r)$ is the prince index of manufacturing goods, which represents intermediate input. β is labor input share(see Equation 14.1 in p.242, Fujita-Krugman-Venables: FKV).

GDP at location r is expressed as follows:

$$Y(r) = w_M(r)L_M(r) + f_A(r) + w_S(r)L_S(r) \tag{2}$$

where $w_X(r)$ and $L_X(r)$ are the nominal wage and the labor input of sector x at location r respectively. See Equation 14.11 in p.244 of FKV.

B-3 Output

The output (GDP + the value of intermediate goods) at location r is expressed as follows:

$$E(r) = \mu Y(r) + \frac{1-\beta}{\beta} w_M(r)L_M(r) \tag{3}$$

where μ is the shere of expenditure on manufacturing goods. See Equation 14.10 in p.244 FKV.

B-4 Price Index

The price indices of manufacturing goods and service goods are as follows, derived form Equation 14.6 in p.243 of FKV.

$$G_M(r) = [\sum_{s=1}^{R} L_M(s) w_M(s)^{(1-\sigma)\beta} G_M(s)^{\sigma(1-\beta)} (T_{rs}^M)^{1-\sigma}]^{\frac{1}{1-\sigma}} \tag{4}$$

$$G_S(r) = [\sum_{s=1}^{R} L_S(s) (w_S(s) T_{rs}^S)^{1-\sigma}]^{\frac{1}{1-\sigma}} \tag{5}$$

B-5 Nominal Wage in Manufacturing Sector

The nominal wage in manufacturing sector is expressed as follows:

$$w_M(r) = A_M(r)\left[\frac{\beta^{\frac{1}{\sigma_M}} [\sum_{s=1}^{R} E(s) G_M(s)^{-(1-\sigma_M)} T^{1-\sigma_M}]^{\frac{1}{\sigma_M}}}{G_M(r)^{1-\beta}}\right]^{\frac{1}{\beta}} \tag{6}$$

where $A_M(r)$ is the efficiency of produciton for manufacturing goods at location r, σ_M is the elasticity of substitution between manufacturing goods.

B-6 Nominal Wage in Service Sector

The nominal wage in service sector is expressed as follows:

$$w_S(r) = A_S(r)[\sum_{s=1}^{R} Y(r)(T_{rs}^S)^{1-\sigma_S} G_S(s)^{-(1-\sigma_S)}]^{\frac{1}{\sigma_S}} \tag{7}$$

where $A_S(r)$ is the efficiency of produciton for service sector at location r, σ_S is the elasticity of substitution between service goods.

B-7 Real Wage

The real wage is expressed as follows:

$$\omega(r) = \frac{average(w_A(r), w_M(r), w_S(r))}{G_M(r)^{\mu} G_S(r)^{\nu}} \tag{8}$$

which is derived form Equation 14.8 in p.243 of FKV.

B-8 Population Dynamics

- Intra Country Population Dynamics is expressed as follows:

$$\lambda(r) = \frac{L_A(r) + L_M(r) + L_S(r)}{\sum_{s=1}^{R(c)} (L_A(s) + L_M(s) + L_S(s))} \tag{9}$$

$$\dot{\lambda}(r) = \gamma_c(\frac{\omega(r)}{\overline{\omega}(c)} - 1) \tag{10}$$

where $\dot{\lambda}(r)$ is the change in the labour(population) share for a region in a country, and γ_c is the parameter to determine the speed of immigrating between regions in a country.

- Inter Country Population Dynamics is expressed as follows:

$$\lambda(c) = \frac{L_A(c) + L_M(c) + L_S(c)}{\sum_{s=1}^{c} (L_A(s) + L_M(s) + L_S(s))} \tag{11}$$

$$\dot{\lambda}(c) = \gamma_w(\frac{\overline{\omega}(c)}{\overline{\omega}_w} - 1) \quad (12)$$

where $\dot{\lambda}(c)$ is the change in the labour(population) share for a country, and γ_w is the parameter to determine the speed of immigrating between countries.

- Inter Industry Population Dynamics is expressed as follows:

$$\lambda_I(r) = \frac{L_I(r)}{L_A(r) + L_M(r) + L_S(r)} \quad (13)$$

$$\dot{\lambda}_I(r) = \gamma_L(\frac{\omega_I(r)}{\overline{\omega}(r)} - 1) \quad (14)$$

$I \in \{A, M, S\}$

where $\dot{\lambda}_I(r)$ is the change in the labour(population) share for a industry within a region, and γ_L is the parameter to determine the speed of job change within a city.

APPENDIX C: IMPORTANT PARAMETERS

C-1. Transport Costs

Transport costs are defined by industry: T_M is for the manufacturing sector, which equals 1.25, typically. T_S is for the service sector and equals 50, typically[7]. The transport costs are standardized by assuming that one is moving a good between Kuala Lumpur and Singapore (slant distance) at 40km/h. Thus, T_M=1.25 means that 1.00 unit of manufacturing goods arrives at Kuala Lumpur out of 1.25 unit of the goods shipped from Singapore, after transported at 40km/h[8]. Or it is understood that bringing goods from Singapore to Kuala Lumpur requires 25 percent overhead costs on the price of the

[7] This study sets the transport cost for agricultural good $T_A = 1.0$. This means that there is no cost to bring agricultural goods to other places. It seems to be an extreme assumption, but it is quite common in the literature of spatial economics. This standard is followed at this point, but the transport costs needs to be incorporated in the agricultrural sector in future studies.

[8] This type of specification of transport costs is very popular in spatial economics as "ice berg" transport costs.

good. As for service sector, T_S=50 means that bringing a service to another place costs exorbitantly high---i.e., most of the service is consumed at the place in which the service is provided.

C-2. Elasticity of Substitution

The elasticity of substitution between goods is also defined by industry. σ_M is for the manufacturing sector and equals 1.5, typically. σ_S is for the service sector and equals 50, typically[9]. If σ=1.0, it means that two goods are perfectly differentiated and cannot substitute each other. On the other hand, If $\sigma = \infty$, two goods are perfect substitutes. So, σ_M=3 means the goods are highly differentiated in the manufacturing sector, and σ_S=50 means that services are not differentiated much, and one can enjoy similar services wherever one is located.

C-3. Parameters on Labor mobility

Parameters on labor mobility is set in three levels, namely, international labor mobility (γ_N), intranational (or intercity) labor mobility (γ_C), and interindustry labor mobility (γ_I) within a region. What does $\gamma = 1.0$ means? It means that a country/region having two times higher real wage than the average induces 100 percent labor inflow a year.

Set γ_N=0 here. That is, the international migration of labor is prohibited. Although this looks like a rather extreme assumption, it is reasonable enough, taking into account that most ASEAN countries strictly control incoming foreign labor[10].

Set γ_C=0.02. This means that a region having two times higher real wage than the national average induces 2 percent labor inflow a year.

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[9] Agricultral goods is treated as homogenious goods, and not differentiated at all.

[10] There are large numbers of foreign workers in Singapore and Malaysia. However, these two countries set strict quota on foreign workers.

Set γ_I=0.05, too. This means that an industrial sector having two times higher real wage than the average in the region induces 5 percent labor inflow from other industrial sectors a year.

C-4. Other parameters

Set consumption share of manufacturing goods (μ) at 0.4 and the share of service sector (ν) at 0.2, respectively. Thus, that of agricultural goods is at 0.4. This must be calibrated and differentiated for each country. However, identical utility function is used for consumers for all countries for simplicity.

Set labor requirement in the production of agricultural goods (α) at 0.8 and that of manufacturing goods (β) at 0.6. Thus, the input share of intermediate goods in manufacturing goods production is 1-β=0.4. These parameters should be calibrating for each industry more carefully in the future.

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