XII. INFRASTRUCTURE INVESTMENT NEEDS AND FINANCING

This chapter provides order-of-magnitude examples of investment needs and possible financing mechanisms that might be considered in extending fragmented, international production systems to inland sites in Asia, thus developing an Asian Integrated Transport Network.

A. Investment needs

By any measure, investment needs for transport infrastructure in Asia and the Pacific for the coming years are the largest of all world regions, due to burgeoning economic growth and further integration of Asian economies into the world economy. It should be noted that investment needs presented in this Chapter are sums of actually identified priority projects of governments. Of course, such a wish-list approach produces different estimates than those based on the usual econometric estimates which essentially assume a continuation of historical dynamics. In other words, numbers presented here are lower limits of what needs to be invested in order to achieve the desirable future targets. Yet, they are higher than estimates based on historical dynamics, implying a need to significantly increase infrastructure investments in the region.

1. International transport backbone network

The international backbone of the transport system consists of nodes such as airports, ports and ICDs, as well as inland links such as major railway lines and roads. In the case of Asia, the latter two have been formalized as Asian Highway and Trans-Asian Railway lines. In terms of international accessibility, these are the highest priority assets for investment purposes.

According to the annual forecast of ESCAP's Maritime Policy Planning Model (MPPM), about 930 new container berths will be required in the world to meet the increased throughput in 2015. About 570 of these berths will be required in the ESCAP region and ESCAP estimates total investment needed at around US$36 billion for the ESCAP region, which is 65 percent of the total world investment needs. As inland sites in Asia are increasingly developed through ICDs and efficient intermodal connections, a similar level of investment will be required for the construction of ICDs in the future as for container ports today.

Under the recent ESCAP project on "Identifying investment needs and priorities for the development of the Asian Highway Network and related intermodal connections", three subregional EGMs were organized in 2004 and 2005[120] that reviewed the status of the Asian Highway network, identified investment requirements for the development of the network, including intermodal connections and prioritized projects of subregional importance. A consolidated picture from the Meetings indicates that about US$ 21 billion is currently being invested or committed for the development of various sections of the Asian Highway routes in member countries. The subregional meetings also identified a shortfall of about US$ 18 billion required to further upgrade and improve about 26,000 km of Asian Highway in 26 member countries.

The ESCAP Secretariat estimates immediate investment needs to be of the same order to magnitude as those of the Asian Highway. In addition to the more than 80,000 km of Trans-

[120] For SAARC (with participation of Afghanistan and the Islamic Republic of Iran) on 21-23 Sept. 2004 in Islamabad; North, central and South-West Asia on 23-25 January in Tehran; and for South-east Asia (with participation of Mongolia) on 25-26 April 2005 in Bangkok.

Asian Railway (TAR) network, thirteen major missing links have been identified. They make up a total of 7060 km requiring roughly US$ 13.5 billion for construction of single track lines. Furthermore, several tens of thousands of TAR lines are still only single-track. To upgrade them to double-track lines would cost several tens of billions of dollars.

A significant share of global airport and air navigation services investment requirements of more than US$ 300 billion between 2000 and 2010 is being committed to airport infrastructure in the Asian and Pacific region, in order to cater for the growth in both passenger and cargo traffic and to accommodate new large aircraft and emerging budget airlines. Over the past decade major new airports in the Asian and Pacific region at Chubu Centrair International Airport (Nagasaki), Baiyun International Airport (Guangzhou), Kuala Lumpur (Kuala Lumpur International), Hong Kong, China (Chek Lap Kok), Imam Komeini International Airport (Tehran), Osaka (Kansai), Incheon International Airport (Seoul) and Pudong International Airport (Shanghai) required a combined investment of more than US$ 50 billion. Bangkok's new Suvarnabhumi Airport is due to open in 2006 and new airports are being started at Bangalore and Hyderabad in India. Current plans are to continue the development of these new facilities, to upgrade existing hub airports and to construct completely new airports requiring at least another $20 billion funding by 2010. In the past two years in Asia and the Pacific, eight new terminal and building extensions have been completed, while work is underway for construction of three terminals and seven new terminals are planned.

2. Access networks and secondary and feeder routes

Typically more than half of a developing country's government's public maintenance and investment in the transport sector is in roads. This is also mirrored by the fact that roughly 70 percent of the World Bank transport loan portfolio remains to be for the road sector. This is despite the Bank's policy change since the early 1990s to focus on direct poverty alleviation rather than an approach targeting merely economic growth. However, this shift and the full adoption of the results-based budgeting approach has led to an increased investment in rural access roads, in order to be able to define a clear target group of people whose poverty has been reduced as a result of the infrastructure intervention.

Financing of rural roads has become a big issue. The grand total for connecting all the currently unconnected villages (roughly 50 percent of the total) with all weather black topped roads has been estimated at US$ 26 billion (Rs. 1,11,000 crores), excluding the cost of major bridges[121]. This compares with currently[122] committed investments in the Indian sections of the Asian Highway, i.e., the road backbone network, of roughly US$ 3.6 billion. Similarly, the Chinese government plans to construct 400,000 kilometres of new rural roads to connect 80 percent of all villages in China by 2020, compared to currently committed investments of US$ 6.6 billion in the Chinese sections of the Asian Highway. This indicates that financing needs for rural roads in the region might be one order of magnitude larger than for the road backbone network.

As governments and donors have focussed on international connectivity on the one hand and access networks on the other hand, the part in between, the secondary and feeder roads have been increasingly neglected. In some cases, this has become a serious issue, as the efficiency of the road *system* depends on the state of *all* its links and nodes.

[121] PMGSY project in India, http://www.pmgsy.nic.in/pmg216.asp

[122] as of July 2004

No comprehensive estimates exist of financing needs for urban transport, including mass transit systems, in Asia and the Pacific. However, rough estimates of investment needs for urban transport are approximately as large as those for airports and seaports combined, or half of total investments into roads.

3. Contributions of individual, private investments

While the investments into road and railway infrastructures have been almost entirely public investments by the some government, the fact is often overlooked that such public investments lead to much larger private investments.

For example, for each dollar of public investment in new roads there are typically ten dollars of private investment (e.g., in cars, etc.) to make system operational and to be able to provide road transport services.

4. Future liabilities for maintenance

Besides investment costs, future liabilities for maintenance costs need to be taken into account. This applies especially to rapid nation rural road access projects. If a large share of the roads have a similar age, subsequent maintenance needs will also cluster at one point in time. A case in point are massive rural road projects in South Asia which, not surprisingly, coincide with serious underfunding for road maintenance. Similarly, road and rail maintenance is a major issue in Central Asia.

5. Transport Investment needs to achieve the MDGs

The question that is often asked is about approximate transport investments needed in order to help achieving the MDGs. The focus of the answers is then mainly on provision of rural access roads, and the replicability of *direct* poverty interventions is discussed. While this seems to be the obvious direction to take, it does *not* appear the most efficient approach. In this context, the comparison between poverty effects if infrastructure investments in China and India is often made. China's phased focus first on international connectivity and later on domestic access has been more successful in overall poverty reduction but has led to higher inequality. While there are clearly problems with such a direct comparison, the superior performance of the Chinese infrastructure model is easily understandable for at least two reasons:

(a) Investment needs for transport backbone networks are only a fraction of those needed for providing nation-wide access, yet the economic benefits derived by countries are very large, even though they initially only accrue to few locations. If the investment needs discussed in this section are summed up, roughly US$ 120 billion per year would be needed in the ESCAP region for all transport modes from 2005 to 2015. Only US$ 22 billion of this sum would be for transport backbone networks, including ICDs.

(b) It is a simple logic that building a road to rural village will not make much difference if the linkage to the rest of the network are not well developed. In the end, what really counts is whether the infrastructure intervention improves the linkage to economic opportunities. The significant poverty alleviation effect in a corridor (with a width of walking distance) along inter-city trunk roads in India is a case in point[123].

[123] Study by the Asian Institute for Transport Development (AITD), 2004.

In conclusion, it appears that the most cost-effective transport infrastructure intervention for achievement of MDGs is a phased one that tries to adjust an optimal combination of international and domestic connectivity at any point in time.

B. Financing mechanisms

In view of the large investment needs identified in this study, countries will have to explore all possible financing options that are available to them, including traditional public expenditure, loans provided by development banks, official development assistance, and different types of private sector participation.

1. Private sector participation

(a) Current trends

A number of different mechanisms exist via which the private sector may participate in development projects in general, and in transport infrastructure projects in particular.

(i) Reduced private sector capital flows into the transport infrastructure development in the region

A recurrent ESCAP publication, the *Review of Developments in Transport* details trends in investments in transport infrastructure projects with private sector participation (PPI) in the ESCAP region and the rest of the world, between 1990 and 2003, and include management and lease contracts, concession, Greenfield and divestitures. Over this period, the majority of PPI projects in the ESCAP region, both in terms of the number of projects and their value in 2003 US dollars, were concession and Greenfield projects[124]. The number and value of PPI projects in developing countries fluctuated dramatically between 1990 and 2003. In 1997, investment totalled $22.4 billion, before dropping rapidly in the following years. As a result, despite a modest increase between 1999 and 2001, in 2003 total PPI transport investment amounted to only $4.5 billion (Box 4).

[124] All references to US$ value of PPI projects in this section from this point forward are in US$(2003).

Box 4: Transport sector project investments in ESCAP countries with private sector participation, 1990 - 2003 (millions of 2003 US dollars)

Airports	*US$ million*	*Sea Ports*	*US$ million*
Vietnam	15	Myanmar	50
Thailand	16	Vietnam	100
Armenia	50	Russian Federation	102
India	125	Thailand	199
Malaysia	130	Sri Lanka	240
Cambodia	185	Turkey	335
Turkey	390	Pakistan	448
Russian Federation	413	Philippines	960
Philippines	520	India	1,256
China	1,677	Malaysia	2,231
		Indonesia	2,586
		China	4,884
ESCAP total	**3,520**	**ESCAP total**	**13,392**
Global total	**12,435**	**Global total**	**21,157**
ESCAP share of global	**28%**	**ESCAP share of global total**	**63%**
Railways	*US$ million*	*Toll Roads*	*US$ million*
India	85	Bangladesh	-
China	2,070	Cambodia	7
Thailand	2,772	Vietnam	10
Malaysia	5,687	Lao PDR	100
		Thailand	632
		Indonesia	934
		India	961
		Philippines	1,309
		Malaysia	6,214
		China	14,358
ESCAP total	**10,615**	**ESCAP total**	**24,525**
Global total	**27,627**	**Global total**	**64,330**
ESCAP share of global total	**38%**	**ESCAP share of global total**	**38%**
Shares by Subsector (percentage)			
Global		**Asia**	
Airports	10	Airports	7
Sea Ports	17	Sea Ports	26
Railways	22	Railways	20
Toll Roads	51	Toll Roads	47

Source: Review of Transport, 2005, ESCAP, www.unescap.org./ttdw/

Data source: World Bank Private Participation in Infrastructure (PPI) database [online resource] http://ppi.worldbank.org accessed July 2005. Global totals are totals for low and middle income countries only. Totals may not add up due to independent rounding.

The East Asian economic crisis greatly contributed to this contraction in private investment. Of all the ESCAP subregions, East Asia has historically received the greatest level of investment in transport infrastructure projects with private sector participation; on a global scale, it is second only to Latin America and the Caribbean. Since the crisis however, investment has never returned to its pre-crisis position, attributable to private sector wariness towards the risks of such investment[125]. In 1996 for example, PPI projects in East Asia

[125] Asian Development Bank, Japan Bank for International Cooperation and the World Bank, 2005. *Connecting East Asia: A New Framework for Infrastructure* (ADB, Philippines)

totalled $8.5 billion; after a notable variation in the intermediary period, by 2003 this had plummeted to $1.7 billion.

(ii) Flows concentrate on few countries and few sectors

The aggregate value of PPI transport projects completed world-wide during 1990 and 2003 was over $120 billion, almost 40 per cent of which were in the ESCAP region. Yet this activity took place in only 16 ESCAP countries, and mainly in 5 countries, namely China, Malaysia, Thailand, The Philippines and Indonesia. Investment was greatest in the roads sub-sector (US$ 25 billion), which accounted for one half of all PPI transport projects. And over 50 per cent of these 188 road projects took place in China, where US$14 billion was invested. In the same period, investments in projects with private sector participation in ports totalled US$13.4 billion, in railways US$10.6 billion and in airports US$3.5 billion.

(b) Public-private partnerships

The 2005 and 2003 editions of the aforementioned ESCAP Publication *Review of Developments in Transport in Asia and the Pacific* includes a list of major PPI projects. It also discusses examples of institutional development, policy and regulatory frameworks that have been introduced recently, in order to promote private sector involvement in infrastructure development. One major issue is the general lack of seed financing for feasibility studies, in order to proceed governments' project ideas to a stage where the private sector would get interested. This is a particularly acute problem in the smaller ESCAP economies.

2. Public sector

Traditionally it has been mainly the public sector that has directly borne the bulk of transport infrastructure investments. This is still the case in most ESCAP countries and particularly in the land transport sector, due to the concentration of private sector flows into few sub-sectors and few selected countries. As a result, the roles of private and public sector needs to be defined on a country-by-country and subsector-by-subsector basis.

3. Cross-border financing

As differences in living standards are very large in the ESCAP region and benefits of transport infrastructure development spill over national borders, the possibility of cross-border financing (well beyond the ODA type) has recently received increased attention. It is particularly discussed in the context of transit transport and landlocked countries, as well as in terms of seed financing. One example of actual cross-border financing is the construction of a road for transit through Lao PDR connecting China to Thailand (Box 5). Innovative financing mechanisms such as in this case, particular promise for the region, particularly when combined with some sort of private sector participation (e.g., through transit fees).

Box 5: Subregional cooperation in road infrastructure development between Thailand, Lao PDR, China (Road between Boten and Houayxay).

One particularly interesting example of subregional cooperation for road infrastructure development is the current upgrading of the existing 228-kilometer road between Houayxay and Boten in the Lao PDR, with the objective to create an international north-south corridor linking Thailand and the People's Republic of China (Figure 16).

This project is carried out under the framework of the Northern Economic Corridor of the Greater Mekong Subregion Programme (GMS) promote by the Asian Development Bank (ADB). The Project will help accelerate trade and transport in the GMS. It will also link two remote provinces of the Lao PDR to fast growing economies. Louang Namtha province is the most transport deficient province in the Lao PDR whereas Viangphoukha district of Bokeo province is among the poorest in the country. The project includes a social action plan for the ethnic minorities, and capacity building in environmental and social monitoring.

The improved road will follow a combination of class II and class III standards, with seven-meter wide paved road and pavements ranging between 1.5 meters and 2.5 meters in width. The total project cost is estimated at $96 million. The governments of Thailand and the PRC have provided concessional loans estimated at $30 million each on a bilateral basis to the Lao PDR. ADB will finance another third of the project cost through a loan of $30 million, covering construction of 74 kilometers in the middle section, whereas the Government of the Lao PDR will cover the remaining costs amounting to $7.3 million. The estimated project completion date is 31 December 2006.

Road maintenance will be financed through transit charges. In order to determine the level of fair and sustainable charges, ESCAP undertook a study of transit charges which also includes comparisons with charging practises in other parts of the world. The findings of the study are currently being assessed under Protocol 2 of the GMS Agreement for the facilitation of cross-border transport of goods and people (http://www.adb.org/GMS/Cross-Border/milestones.asp).

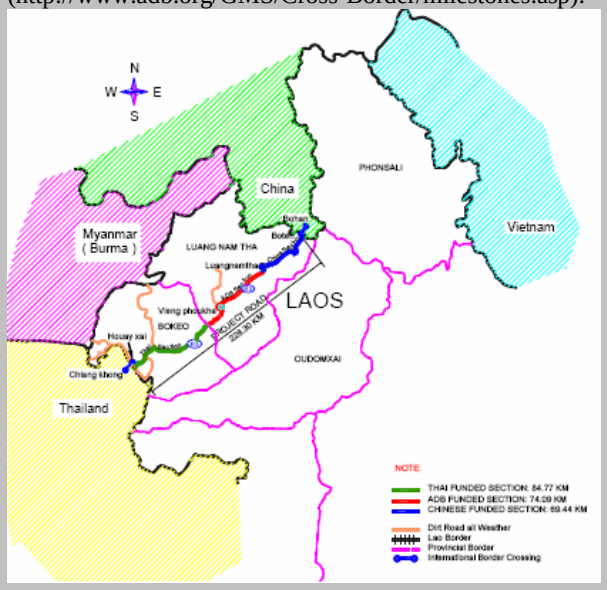

Figure 16: Map of Boten-Houay Xai Road linking Thailand and China through Lao PDR.

Indeed, the general case for regional cross-border financing of transport infrastructure is very strong, as illustrated by a recent ESCAP study on Central Asian Accessibility[126]. This study illustrates the accessibility impact of road upgrades, based on a comprehensive view of Central Asian road system. Take for example the route between the nationally and internationally rather accessible Shymkent and the less accessible Aktyubinsk. Assuming an

[126] Lundin, A. (2005). *Central Asian Accessibility*. Draft report, ESCAP.

upgrade of this route leading to a 10 percent increase in average speed along all links on the route, leads to significant improvements in potential accessibility[127] not only nationally in Kazakhstan, but also internationally, thus showing large positive externalities across international borders (Figure 17). The positive changes in accessibility are quite striking along the route, and in places whose connectivity is dependent on this route[128].

The few other existing examples of such cross-border financing (mainly in Europe) show that the great potential of such an instrument. However, they also show the need for adequate institutional mechanisms that are required for an efficient larger-scale application of such instruments and that are currently absent in the ESCAP region.

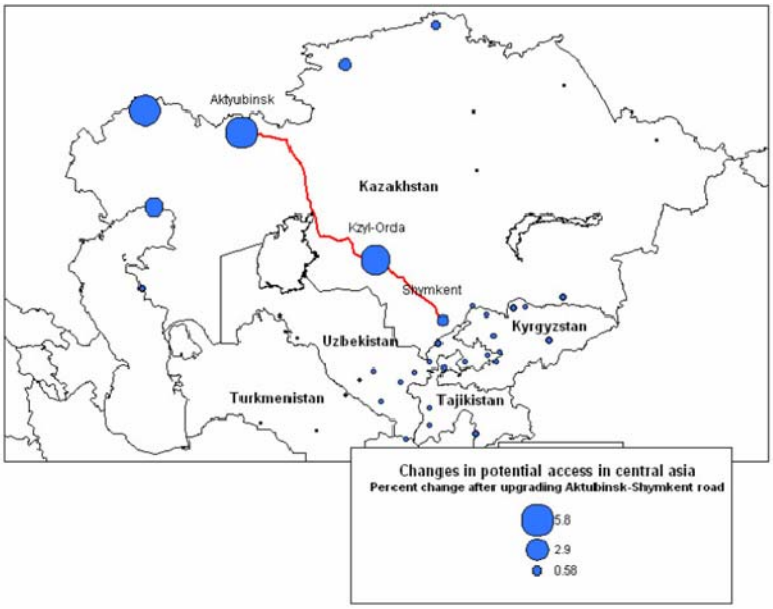

Figure 17: Changes in potential accessibility due to an upgrade of the road between Shymkent and Aktyubinsk, leading to an increase in speed by 10 percent.

4. Conclusion

Under any plausible scenario, the ESCAP region faces increased investment needs in transport infrastructure in the coming decades. In particular, this chapter identified the need to significantly increase overall infrastructure financing in all ESCAP member countries to the order of US$ 120 billion per year for the ESCAP region as a whole, in order to create an Asian integrated transport network for international production networks to be gradually extended to inland sites of Asia.

A major challenge for countries in the region has been the reduced private sector investment flows and their concentration on few countries and sectors. ESCAP members

[127] Geographical accessibility assesses the potential for interaction through the average time to reach places, while the potential accessibility is based on a gravity concept, where accessiblity is a trade-off between attractiveness of places and the effort to reach them. More focus is put on the accessibility of the largest/capital cities than on other places, as these cities are more likely to function as growth poles.

[128] This study also showed that the potential accessibility generally follows the same rank size rule as that for city population. Consequently, a focus on improvement of interconnection of major cities has the greatest impact on potential accessibility within the transport system.

have been exploring new financing mechanisms. A major constraint in attracting private sector participation has been the lack of seed financing that would be needed to for initial feasibility studies. Selected examples exist that show the great potential for possible cross-border financing and other innovative financing.