

Logistical and Transportation Infrastructure in Asia: Potential for growth and development to support increasing trade with Europe

by

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Submitted to the Department of Civil and Environmental Engineering in partial fulfillment of the requirements for the degree of

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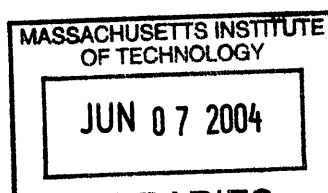
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Abstract

This thesis examines the implications of the rapid growth in demand for trade between Europe and Asia for the existing transportation network and logistical infrastructure. In general terms, technologies need to improve and be compatible with each other, multimodalism and interconnectivity of the various modes needs to be fully implemented, capacities have to grow, facility efficiencies need to improve, planning processes, and government policies need to be updated, along with the growth of demand in the region. The nature and extent of the required changes depend on the role of each country in the region, as well as the capabilities and utilization of the existing infrastructure.

The methodology involves an ABC analysis that groups the Asian countries in three categories depending on their level of development and infrastructure. The major transportation modes (urban, road, rail, sea, and air), the logistical infrastructure and the importance and use of Information Technology are examined.

Leading economies of the region, categorized as “A” countries, appear to be very successful and are highly competitive in global trade. Network optimization and high technology applications, such as Intelligent Transportation Systems and Electronic Data Interchange can improve these countries’ use of infrastructure. Developing countries of the region, categorized as “B” countries, need to further implement best practices and attract funds for the development of their infrastructure. Their needs include further development of the transportation network and integration of all the modes in order to assist their economy and global positioning. “C” countries have inadequate or non-existent infrastructure. These countries need to build or expand their basic infrastructure in order to assist in the transportation of their own products and be able to communicate with the rest of the world. Moreover, international interests imply that these countries provide adequate regional networks that interconnect with those of their neighbors.

Directions are provided for the steps that need to follow in the developmental process. Priorities and policy options are analyzed.

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Chapter One: Introduction

1.1 Project Description and Hypothesis, Motivation, Thesis Objectives, Methodology and Approach

The trade flows within Asia, and between Asia and the rest of the world are already huge. Within a continuously expanding volume of international trade, the Asia-Pacific region has been the most dynamic region in the last decade. The demand for imports and exports of this major market is anticipated to grow even more in the coming years. The first step in the analysis is to present the forecasted increase in demand in the area.

In order for that growth to be successful and bring desirable results in terms of profits to the area, the transportation sector will have to be capable of dealing with the expected high level of demand and the operating requirements for various market segments. The physical requirements for success are a well developed network of modes, which allows intermodality and interconnectivity and facilitates the flows of commodities and people and operates efficiently with the usage of information technology.

In particular, the level of infrastructure in Asia is examined in relation to the routes towards its west. Trade between Asia and Europe has increased in recent years and is expected to grow more in the future. Trade between Asia and Europe involves highways and railways, as well as ocean and air transportation. It is thus and seems to be more complex than the highly developed trade between Asia and the Americas, which is focused on ports and airports.

The potential for infrastructure development is discussed with references to an extensive literature review and suggested techniques for better utilization of the existing resources. The transportation and logistical infrastructure in such a developing area plays a key role in the efficiency of the operations in the global arena of competition. If the infrastructure within the countries that want to expand their trade, as well as in the neighboring countries that are intermediates and flows need to pass through, is inadequate, their positioning in the market will not be winning and the infrastructure will be, instead of a promotion tool, their competitive disadvantage.

The methodology used is an ABC analysis of the countries that belong to the area. As used in statistics and economics for the revenue management of a company, an ABC analysis divides the products of a company into three categories, depending on the revenue that they generate from their sales. The equivalent of an ABC analysis is applied here, in order to categorize the countries in the area by their level of infrastructure. Depending on the volume and importance of trade for each country, as well as the type of commodities imported and exported, the countries are blocked in three different categories.

The countries that belong to category A are the developed countries that have the entire needed infrastructure in place. These are leading economies and great examples for the rest. These countries simply need to keep up with the fluctuation of demand and be flexible by adopting change techniques in order to stay at the top of the competition. Sometimes these countries also need to use additional technologically advanced tools so

as to improve the quality of life of the habitants (lower the travel times in urban transportation, improve the quality of the air in the congested areas), as well as maximize the utility of the restricted capacity that they have in order to respond to the demand of the market (the developed countries are small in size and have capacity limitations, see Japan, Taiwan, Singapore, Hong Kong).

The countries that belong to category B are rapidly developing countries that currently have some of the transportation network components developed but lack the complete coordination of the network or some of the modes that are necessary for the optimal and complete functioning of the system. These countries are in the process of attracting funds from international organizations and are trying to establish their identity as trade parties and create a niche in the Asian region. Trade for these countries is an extremely important means that will make them more competitive and give them a new role internationally. Foreign investment has been or currently is seriously considered in these countries.

Finally, the countries that belong to category C are developing countries that have serious problems in their infrastructure. These are commonly countries that have had political instability over the past years and lack the funds and organization for improvement. In this category there also belong countries that might not need infrastructure in order to export their products or import from their neighbors but their country's strategic positioning makes it imperative for them to have at least a basic, functional and

acceptable network in order to facilitate international trade; these countries are also known as intermediate countries.

Furthermore, the analysis assesses the existing conditions in infrastructure. In some cases the network is non-existent or there is a lack of interconnectivity among the different modes, and in other cases there are findings of a non-fully developed network and the flaws of the systems. The infrastructure level in each country needs to be examined by looking at the size of the road, rail, port, and air facilities, as well as their quality (by looking at the paved ratio, capacity, and density).

The analysis includes a review of the plans that are already in place for increasing and improving the existing networks. Organizations and groups such as the World Bank (WB), the World Trade Organization (WTO), the Asian Development Bank (ADB), the Organization for Economic Cooperation and Development (OECD), the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), the European Conference of Ministers of Transport (ECMT), the United Nations Economic Commission for Europe (UN-ECE), the United Nations (UN), and the European Union (EU) have realized the potentials and needs of this area.

The analysis also suggests further steps that need to be made for Asia to grow even more and balance out some current social inequalities. Sustainable transport development is discussed in order to alleviate poverty and unemployment rates, while building better

infrastructure. Moreover, the implementation of developmental projects can contribute to a more social and environmental friendly face and improve efficiency and effectiveness.

The potential for the Asian countries, grouped in three different teams, differ a lot. Their interest and priorities vary depending on their location, wealth, economic performance, and social status. At the end of this stage, the analysis introduces directions for the improvement of the transportation and logistics sector in all three categories.

In addition to that, the role of the governments is discussed, the policy side of the issue is considered, and several best practices are suggested, in order for the governments to control the externalities, overcome the existing or potential bureaucratic obstacles, and simplify their trade techniques.

The goal of this thesis is to provide guidelines and priorities for the creation of a better transportation and logistical network in the area. That requires at least basic investment for infrastructure that is missing in some cases, and improved and innovative technological changes in others, in order to respond to the growing demand of operations.

The recommendations include:

- Creation of a basic network sufficient for international and interregional trade
- Expansion of capacity of existing routes to keep pace with traffic
- Better connections among different modes

- Management of congested infrastructure (ITS, pricing)
- Facilitation of freight mobility in congested urban areas
- Expansion and improvement of terminal facilities
- More efficient warehousing techniques (storage, production management, order placing, and product tracking)

A key issue for the implementation of the above recommendations is the financing of the investments. Thus, before suggesting any steps the analysis justifies the double reason for investment: the direct development of the Asian trading parties' facilities, and the construction of the intermediate routes that will be serving the trade flows and allow more equal development of the region (bridging the current gap of having two countries in the same region such as Hong Kong with GDP per capita of \$27,200, and Afghanistan with GDP per capita of \$700).

From the government side, this analysis suggests pricing and taxing policies implied in various purchases and operations within the countries. It also suggests environmental sensitivity in operations, and building of bilateral agreements, peace-making, and professional intergovernmental affairs among the countries that need each other's facilities (port access for land-locked countries; upgrades to intermediate rail or highway routes in C countries). The analysis identifies the social side of the transportation investment as a policy measure to alleviate inequality.

Finally, the analysis poses and answers questions such as:

- How are problems, issues, and policies different in the A, B, and C countries?
- What are the priorities?
- What are the main (best) policy options?
- What are the roles for Asian countries, cities, carriers, shippers, and World Organizations?

1.2 General

1.2.1 Population in Asia

Asia is home to more than half the population of the planet (estimated at around 6.3 billion people). The growth rate of this population is significantly high, even though it has dropped in the past years. In Table 1 one can see in detail all the countries in the area by region in descending order according to their population.

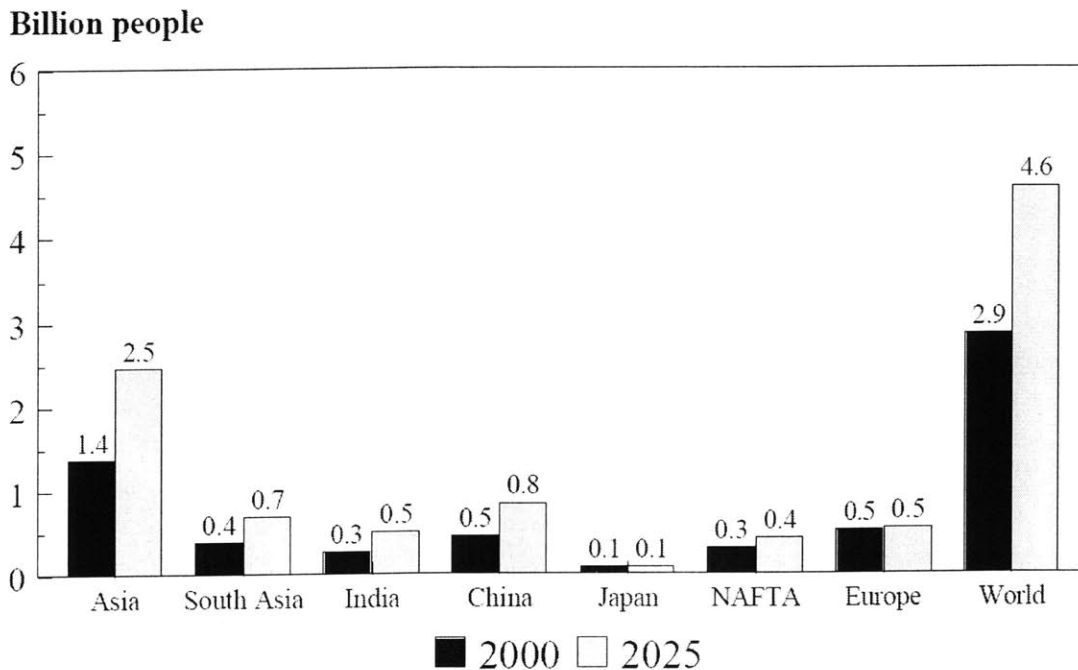
Table 1 Population in billion and annual growth rate by region [2002] [CIA, The World Fact book, 2004]

North, Central and East Asia				South and the Pacific				West Asia, Middle East			
China	1,284.30	0.87%		Indonesia	228.44	1.54%		India	1,049.70	1.47%	a
Russia	144.53	-0.30%	a	Bangladesh	138.45	2.06%	a	Pakistan	150.69	2.01%	a
Japan	126.97	0.15%		Philippines	84.53	1.99%		Iran	68.28	1.08%	a
South Korea	48.32	0.85%		Viet Nam	81.10	1.43%		Turkey	68.11	1.16%	a
Afghanistan	28.72	3.38%	a	Thailand	62.35	0.88%		Iraq	24.68	2.78%	a
Nepal	26.47	2.26%	a	Myanmar	42.24	0.56%		Saudi Arabia	24.29	3.27%	a
Uzbekistan	25.98	1.63%	a	Malaysia	22.66	1.91%		Sri Lanka	19.74	0.83%	a
North Korea	22.47	1.07%	a	Taiwan	22.55	0.78%		Syria	17.59	2.45%	a
Kazakhstan	16.76	0.17%	a	Australia	19.73	0.93%	a	Israel	6.12	1.39%	
Azerbaijan	7.83	0.44%	a	Yemen	19.35	3.42%	a	Jordan	5.46	2.78%	a
Pakistan	6.86	2.13%	a	Cambodia	12.78	2.24%		Lebanon	3.73	1.34%	a
Georgia	4.93	-0.52%	a	Hong Kong	7.30	1.26%		Oman	2.81	3.38%	a
Kyrgyzstan	4.89	1.46%	a	Laos	5.78	2.47%		UAE	2.48	1.57%	a
Turkmenistan	4.78	1.82%	a	Pap. New Guinea	5.30	2.34%	a	Kuwait	2.18	3.34%	a
Armenia	3.33	-0.07%	a	Singapore	4.45	3.46%		Bhutan	2.14	2.14%	a
Mongolia	2.71	1.42%	a	New Zealand	3.95	1.09%	a	Qatar	0.82	2.87%	a
				East Timor	1.00	2.13%	a	Cyprus	0.77	0.56%	a
				Fiji	0.87	1.41%	a	Bahrain	0.67	1.61%	a
				Macau	0.47	1.72%	a	Brunei Dar El Sal.	0.35	2.06%	
				Maldives	0.33	2.91%	a	Total	3,974.09		

a: estimate July 2003

The urbanization level of the above countries is extremely high with one in three people living in major cities. The facts shown at the report of the Economic and Social Commission for Asia and the Pacific, Review of Developments in Transport and Communications in the ESCAP Region 1996-2001 [United Nations, 2001] present North and Central Asia to be leading with 67 per cent living in urban areas, followed by South-East Asia with 37 per cent, East and North-East Asia with 35 per cent, South and South-West Asia with 32 per cent and finally the Pacific island economies with 27 per cent. In Figure 1 below, one can see a forecast of the growth of the urban population in Asia by 2025.

Figure 1 Urban Population in Asia is projected to double by 2025 [Coyle, 2003]



In the future, urbanization in the area is only going to increase. The increase in population is mostly going to be observed in urban areas, while the rural areas will remain as they are of today. [United Nations, 2001] This is expected to create serious implications for access to mobility of people and the organization of freight movements. The interconnectivity between major urban areas that will play a role of centers of employment, production and consumption is also a challenge. The development of infrastructure is essential in order to support this massive concentration in population. Table 2 contains the Megacities that will exist by 2015.

Table 2 More than Half of Megacities in 2015 Will Be in Asia [Coyle, 2003]

<i>City</i>	<i>Population (million)</i>	<i>Asia</i>	<i>Coastal</i>
Tokyo	26.4	X	X
Mumbai (Bombay)	26.1	X	X
Lagos	23.2		X
Dhaka	21.1	X	X
Sao Paulo	20.4		
Karachi	19.2	X	X
Mexico City	19.2		
New York	17.4		X
Jakarta	17.3	X	X
Calcutta	17.3	X	X
Delhi	16.4	X	
Metro Manila	14.8	X	X
Shanghai	14.6	X	X
Los Angeles	14.1		X
Buenos Aires	14.1		X
Cairo	13.8		
Istanbul	12.5		X
Beijing	12.3	X	X
Rio de Janeiro	11.9		X
Osaka	11.0	X	X
Tianjin	10.7	X	X
Hyderabad	10.5	X	
Bangkok	10.1	X	X

1.2.2 Population in Europe

As a result of the collapse of the Soviet Block several newly independent states appeared within the Eurasian area. This change created a transformation and development of the Eastern European (including Russia), Caucasian and Central Asian economies. The enlargement of the European Union has created a 420 million consumer market. This market consists of various consumer segments that attract the Asian companies and create great potentials and new business opportunities at both “premium and discount level, mass and niche markets.” [Fuchs, 2003] The changing and expanding role of the EU consisting of 25 countries in 2004 and the new trade and transport policies, based on the principle of mutual interest, change the old patterns and will benefit all. Figure 2 shows the recent and ongoing expansion of Europe.

Figure 2 Europe is expanding [BBC news, 2003]



Even though there are barriers to trade expansion, almost all of the above-mentioned states are eager for re-integration into the world economy. The Eastern European countries (Poland, Czech Republic, Slovakia, Hungary, Slovenia, Malta, and Cyprus and the Baltic Republics: Estonia, Latvia, and Lithuania) are soon going to join the EU, as first generation members; that will facilitate the procedure of integration.

The Eastern Mediterranean area, specifically Eastern Europe, the Balkans, and the Middle East, has a very strategic location as an interface between three continents, Europe, Asia, and Africa. And even though Africa is not a target market for consumer products, the Suez Canal is a vital route for the transport of product among the continents and plays a critical role worldwide. The Black Sea Region has also the potential to offer significant routes that can facilitate the trade between Europe and Asia. [Candemir, 1998]

Other countries, such as Romania, Bulgaria, Turkey (that plan on joining the European Union in the near future), and the Transcaucasian states and Central Asian republics are mainly concerned with the issues of integration into the world economic order. Along comes the need for the restructuring of their transportation networks and organizations so as to lead to a general globalization of economies and trade. The new trade patterns and new transport demands are emerging and are bound to develop further. All parties involved understand the great potentials for cooperation as well as the need for improvement of the existing infrastructure.

As a result, new politico-economic groupings are created, such as the Black-Sea Economic Cooperation Organization (BSEC), and the Economic Cooperation Organization (ECO), in addition to the enlargement of the European Conference of Ministers of Transport (ECMT) and the European Union (EU). [Candemir, 1998]

1.3 Asia targets Europe and Europe targets Asia

Europe has always been looking towards the East. Although it seems that the European consumer products are sometimes too expensive for the majority of the population in Asia, excluding those who live in developed countries such as Japan or the Pacific, a lot of European machinery and equipment are often imported by Asia. Asia, being a labor-intensive area that exports consumer products mostly to the USA, is similarly interested in Europe and lately grows its trend to target the European market.

The European societies are mature societies. The improved quality of life and the low infant mortality rate have prolonged the life expectancy in this area of the planet. The demographics of most European countries show a significant increase of senior people as a percentage of the population, which is expected to grow much more in the nearest future. [Fuchs, 2003] In some cases, the share of the senior people is bigger than the share of the younger ones.

This growing senior segment consists of many wealthy people, in marketing terms known also as “...*High Net-Worth Individuals* or *Affluent Clients*. This group is further growing

in Europe, as the *World Wealth Report 2002* published by Merrill Lynch and Cap Gemini Ernst & Young shows. According to this report Europe's wealthy people currently own about 8.4 trillion (1012) USD, that is 32 per cent of the worldwide money in private hands. In 2001 the Europeans had with 6 per cent the highest growth rate in the worldwide wealth - an amount that has grown by 440 per cent since 1986." [Fuchs, 2003]

At the same time there are approximately 14 million unemployed people in the European Union and about 210,000 bankruptcies in Western Europe in 2002. The result is that there is a new poverty trend in Europe that builds a segment of bargain hunters and discounters who are trying to combine good quality with low prices, something that mostly Asia has to offer because of its cheap workforce.

Additionally, the case of China shows that until recently the highest share of Asian products including textiles, electronics, or consumer durables are export goods for the US markets. As the same paper published by the Asia Pacific Journal of Marketing and Logistics [Fuchs, 2003] presents, in the year 2000 the USA imported hard goods with a value of more than 100 billion US\$ from China; half of these goods have been consumer durables like shoes, toys or sports articles. Today approximately 60 percent of the imported consumer hard goods in the USA come from China, and a great percentage left comes from other Asian countries, where USA companies have outsourced their production. An increasing number of Asian companies try to break this dependence and enter more dynamically into the European market.

According to the same report, Asia's domestic demand is only around 70 percent of the European Union's (15 members) domestic demand, and when Japan is excluded, Asia's domestic demand is only 26 percent of the current European Union's (15 members) demand. Thus, Asian brand companies have a great potential by trading with Europe and can therefore reduce their market risks and generate more revenues.

1.4 Thesis outline

In the first chapter the description of the problem is presented. This problem is supported by the population changes in the two continents that are being analyzed. An introduction to logistics and supply chain management is presented along with the benefits of an improved transportation and logistical network.

The second chapter includes an analysis of the benefits of improved transportation and logistical infrastructure. It explains the general positive effects of a well-built and efficiently-operating network and system in its facilitating role in trade and society. The critical issues in transportation and logistical infrastructure that require the most attention are being developed.

The third chapter presents the trade flows of the countries belonging to the area and categorizes them by an ad-hoc importance factor to three different categories. While some countries are not trading as much as others, the analysis later on explains the advantages of development in general. A background analysis leads to the suggestion for better infrastructure.

The fourth chapter sees each and every transportation mode separately, and suggests changes that need to be made in order to support the growing demand of trade in the area. The existing logistical infrastructure as well as the current information technology is also being commented.

The fifth chapter contains some policy measures that can be adopted in order to facilitate the processes, and general concerns that need to be taken into consideration in the developmental phase of transportation and logistical infrastructure. The environmental and social damages that can occur while a transportation development is taking place is particularly outlined.

Finally, the sixth chapter includes the major findings, the conclusions and the contribution of this thesis.

Chapter Two: The Benefits of Improved Transportation and Logistical infrastructure

An improved transportation and logistical network has a lot to offer to the modern businesses who own part of it (warehouses, possibly port facilities) and utilize it as a whole in order to function in maximum efficiency (from a microscopic point of view). An improved transportation and logistical network is also beneficial to the countries that own it and provide it to their citizens, businesses and foreign users (from a macroscopic point of view). This section presents the elements and benefits of an adequate transportation and logistical infrastructure global system.

2.1 Importance and General Issues in Transportation

“Transportation is the industry that connects other industries”. [Summers, 2000]
Transportation infrastructure is the most critical means that facilitates the movements of people and products. The existence of cost-effective and competitive transport modes assists in the restructuring of trade and industry.

In developed and rapidly developing countries in Asia and around the world, the transportation and logistics infrastructure is, in general, improving continuously. Highways, ports, airports, communication and information systems, and advanced manufacturing techniques assist in the development of advanced supply chains. In

developing countries that lack the funds and attention from the global community, the infrastructure is nonexistent or in pretty bad shape and in some cases deteriorating.

Geography, the climate and older, existing infrastructure are very important factors in the above development. Extreme weather conditions such as desert heat or icy environment and high altitudes make the construction and the maintenance of advanced infrastructure difficult. Road widths, bridge heights, and communication protocols are elements of the infrastructure network that keep on changing along with the technological improvements and the long-term changes of demand and competition.

Better infrastructure and transportation systems are crucial to the economic development and growth of Asia, which needs to “adjust to international competition, reap the benefits of trade expansion and market globalization, and mitigate environmental and social problems from intense urbanization.” [Coyle, 2003]

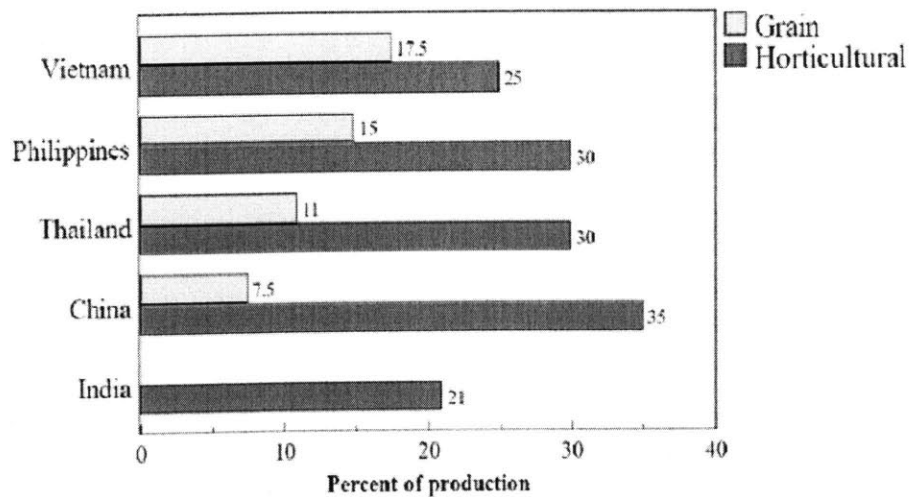
In a paper published by the Puget Sound Regional Council in 2002, the relative importance of transportation infrastructure to the healthy functioning of regional and local economies is mentioned. Efficient freight mobility is one of the most critical transportation goals in order to support the general economic activity of the region. The movement of people in the economic activity is equally critical, considering that employees need to commute within a region and the costs associated with this commute directly contribute to the total costs of labor (as a factor in the production cost function of all goods and services).

2.1.1 Benefits of Transportation

The existence of various options in transportation (different modes to choose from) can improve the economic activity and can result in system-optimum pricing worldwide. A transportation option or a combination of them (road, rail, sea, air, pipelines) can be chosen depending on the time, safety and price sensitivity of the product that needs to be transported. Transportation and logistics services cost, and obviously raise the retail prices of the products shipped and handled. This additional cost can be minimized if the transportation and logistical infrastructure improves enough to cover the forecasted demand. A low “wedge” [Hummels] between the prices paid by consumers and prices received by producers means a combination of a lower price for the consumers and a higher profit for the producers. A better transportation and logistical infrastructure means greater labor demand and better wages. [Hummels]

An improved transportation and logistical network has the ability to reduce the regional price variability. Bad weather can cause shortfalls and high prices in one region while other regions experience surpluses. Especially in the case where the products are perishable (fruits and vegetables), vulnerable in temperature or light condition-differences, and fragile in any way bad weather can be troublesome. The same applies to products that are time-sensitive in general (electronics that lose their value continuously) and all the products that sell in very competitive markets and their lack of existence in the market that experiences shortfall becomes a lost sale, instead of a backorder (which still incorporates an additional cost). In Figure 3 below the post harvest losses are shown in some of the Asian countries because of the bad coordination and infrastructure.

Figure 3 Post Harvest Losses in Selected Asian Countries [Coyle, 2003]



Source: The 5th JIRCAS International Symposium, Post harvest Technology in Asia-A Step Forward to stable Supply of Food Products, Tsukuba, Ibaraki, Japan, Sept. 9-10, 1998

Higher value commodities and more sophisticated manufactures are very sensitive and their quality and value depends linearly to the shipping and handling techniques. Additionally, a low quality transportation and logistical infrastructure that provides poor service with a high cost will lead to the loss of the competitive advantage that the product would have if it were to be consumed at the place where it was produced.

Another advantage of the improved transportation networks is that they increase the available variety of product. It is noticeable that transport costs restrict a large number of products to become available in remote regions with low demand. Often it is unaffordable and inefficient to supply products in Less-Than-Truck Load (LTL) size for example. At the same time, it makes it easier for the exporters to spread geographically in a larger scale. The number of markets accessible increases and economies of scale in shipping are

being created. Thus there is a better response to business cycle fluctuations in those markets. [Hummels]

In addition to the formal productivity benefits, transportation investments can lead to a better quality of life. People can avoid spending valuable time in traffic jams and congestion caused by lack of coordination within the different modes of transportation. A well-integrated transportation infrastructure can eliminate the personal travel times and people can spend time with their families or practice hobbies. The travel time value per freight vehicle is often higher than for individual personal vehicles. This is also true for higher occupancy vehicles (HOVs), because each vehicle carries the travel time value of multiple persons. [Puget Sound Regional Council, 2002]

Well-integrated transportation infrastructure can assure better safety in transportation, less casualties and damages for people and products. In the era of globalization, mobility should not be obstructed by high levels of insecurities in transportation. Higher life expectancy and lower insurance rates are also critical factors that improve the economic activities. A more effective, efficient, and safe transportation system means a lot of savings for the society as far as the environment is concerned, as well as the health and safety of the drivers, riders, and pedestrians.

Last but not least, a well integrated transportation infrastructure can result in environmental benefits and reduce externalities. The environmental impact of transportation can be extremely detrimental in areas where an environmental impact

assessment is not part of the infrastructural design. The improved transportation infrastructure can minimize the usage of particularly polluting modes and control the emissions that are a serious problem in the urban areas.

The combined transport is the most effective method of moving freight because it incorporates all the existing modes as appropriate. Physical barriers in transportation include poor road infrastructure, inadequate control points, and different axle load limits. The creation of imperative missing facilities in poor countries, coordination among the different modes, and a comparison and effort to match the differences in hardware among the neighboring countries can overcome these obstacles. On the other hand, nonphysical barriers consist of additional taxes and fees, and inconsistent transport and customs documentation. An open-minded and modern transportation policy from the governments' part can facilitate the mobility of people and freight and can lower the total cost of transportation that is incorporated in every aspect of our economic life.

In particularly congested urban areas, intelligent transportation systems (ITS) as well as improved transportation management and planning can benefit the society by reducing the distribution and fuel costs, creating more efficient routing and increased speed to market, and increasing productivity and reducing employee turnover due to increased employee satisfaction. [U.S. Environmental Protection Agency, 2003] Transportation demand modeling, Geographic Information Systems (GIS) tools and combined designation of inter-modal systems can assist in the optimal decision-making process of developers, traffic engineers, politicians, and organizations that provide funding to infrastructural projects.

Advanced traffic signal control systems, electronic transit fare payment systems, ramp meters, and collision warning systems are some of the new technologies used in developed and rapidly developing countries in order to optimize total travel times and improve road safety. [United States Department of Transportation, 2003] Their initial, operating and maintenance costs are extremely high though, and their application is not to be considered as a solution by poorer countries of the Asian region that lack the basic infrastructure.

Regions with mature infrastructure and economy, may realize comparatively small returns, further than the travel time savings to users of the system, on marginal investments in transportation infrastructure. On the other hand, regions with immature infrastructure that have poor access to land and other resources, low levels of industrial competition and cooperation, and isolated labor markets may realize large economic benefits further than the travel time savings to individual users. [Puget Sound Regional Council, 2002]

2.2 Importance and General Issues in Supply Chain Management

Supply chain management is a combination of methods that try to efficiently integrate suppliers, manufacturers, warehouses, and stores. The goal is for the companies to produce and distribute the right products at the right quantities, to the right locations, and at the right time, so as to minimize the service costs while satisfying the service level requirements. The supply chain is a complex network, matching supply and demand is a

major challenge, and system variations over time are an important consideration.

[Simchi-Levi et. al., 2002]

Logistics on the other hand incorporate “the planning, implementing and controlling the efficient, cost effective flow and storage of raw materials, in-process inventory, finished goods, and related information from point-of-origin to point-of-consumption for the purpose of conforming to customer requirements.” [Simchi-Levi et. al., 2002]

Supply chain costs may approach 75% of a company’s operating budget. Forecasting of demand, supply and distribution planning, sourcing of inventory for the needs of production and support, and delivery, including ordering, storage, and transportation are techniques involved in the supply chain procedure that require efficiency and skills in order to bring the desirable results. Effective logistics management not only improves the procurement of materials and the service level in the market, but it also reduces total prices. Increasing customer demands for quality and fast delivery make the existence of an integrated supply chain management an imperative need. [US Department of Defense, 2004]

When people discuss optimization of the supply chain management, they often take for granted that there is a transportation network in place that operates efficiently. While the optimization of the given capacity (existing infrastructure) is the key to improvement in developed countries, this is not the case in other countries around the globe, many of which are particularly in Asia. Additionally, in the emerging nations, the supply chain

infrastructure is usually underestimated and considered as a necessary expense instead of a strategic tool. In other cases, the macroeconomic situation {Gross Domestic Product} in emerging nations is not sufficient to implement an advanced logistics infrastructure. Furthermore, the focus of infrastructure development may have been on exports instead of imports and exports. The example of China, where basic inland infrastructure is missing, supports the above statement [Wood et. al., 1995]. [Simchi-Levi et. al., 2002]

The existing socio-economic conditions and political framework of the various countries strongly affect the level of infrastructure and their character and orientation. Countries with relatively cheap land and labor, such as France, have the advantage to build large, “low-tech” warehouses, while others where labor is expensive, such as in Scandinavia have developed automated warehouses. [Simchi-Levi et. al., 2002]

2.2.1 Benefits of Supply Chain Management

The benefits of an advanced logistical infrastructure and efficient supply chain management include [US Department of Defense, 2004] :

- **Improved delivery performance, quicker customer response and fulfillment rates.** Efficient planning and forecasting allows the company to preview the market fluctuations and respond to them before they occur.

- **Greater productivity and lower costs.** The company's efficiency increases because the processes are scheduled carefully long-term and the various costs included in the total cost function, such as the ordering, holding and distribution decrease.
- **Reduced inventory throughout the chain.** Efficient planning saves the involved parties from holding excessive inventory. It is safer and cost efficient to hold only the necessary inventory that will cover the demand for final products, and service requirements.
- **Improved forecasting precision.** The companies have the advantage to closely find the expected fluctuation in the market based on previous data and seasonality.
- **Improved quality of products.** The products, either they are technologically advanced, or agricultural will eventually keep their quality and will not deteriorate while they are in transit or stored at a warehouse.
- **Enhanced inter-operational communications and cooperation.** The company is an organization that is consisted from various departments. These departments need to communicate very closely in order to succeed in their roles. They cannot function independently or based only on the best of their knowledge and information. Lack of coordination may cause catastrophic effects.

- **Shortened repair times and enhanced equipment readiness (known also as velocity management).** In case the products of the supply chain are non-perishable, there is a great possibility that in the future, after being sold and used, they will need reparation. In order to maintain an efficient reverse logistics pipeline supply chain management is required to be in position.
- **More reliable financial information and data accuracy.** Along with the previous bullet, the company has better knowledge when supply chain management is effective and planning is easier and safer.
- **Reductions in operational complexity.** Finally, the companies are given the advantage to operate more efficiently with less complexity and ad hoc mechanisms. The needed procedures are planned frequently or once a year, depending on the nature of the products and markets and less people are needed in routine jobs.
- **Improved cycle times.** In order to improve cycle times, a company needs to pay attention to possibly existing redundant steps, old activities that may no longer add value, activities that are not centralized, old or non-utilized technology; excessive bureaucratic procedures, controls, and forms that stagnate the process, and poor communication, coordination, and cooperation.

Chapter Three: Trade in Asia

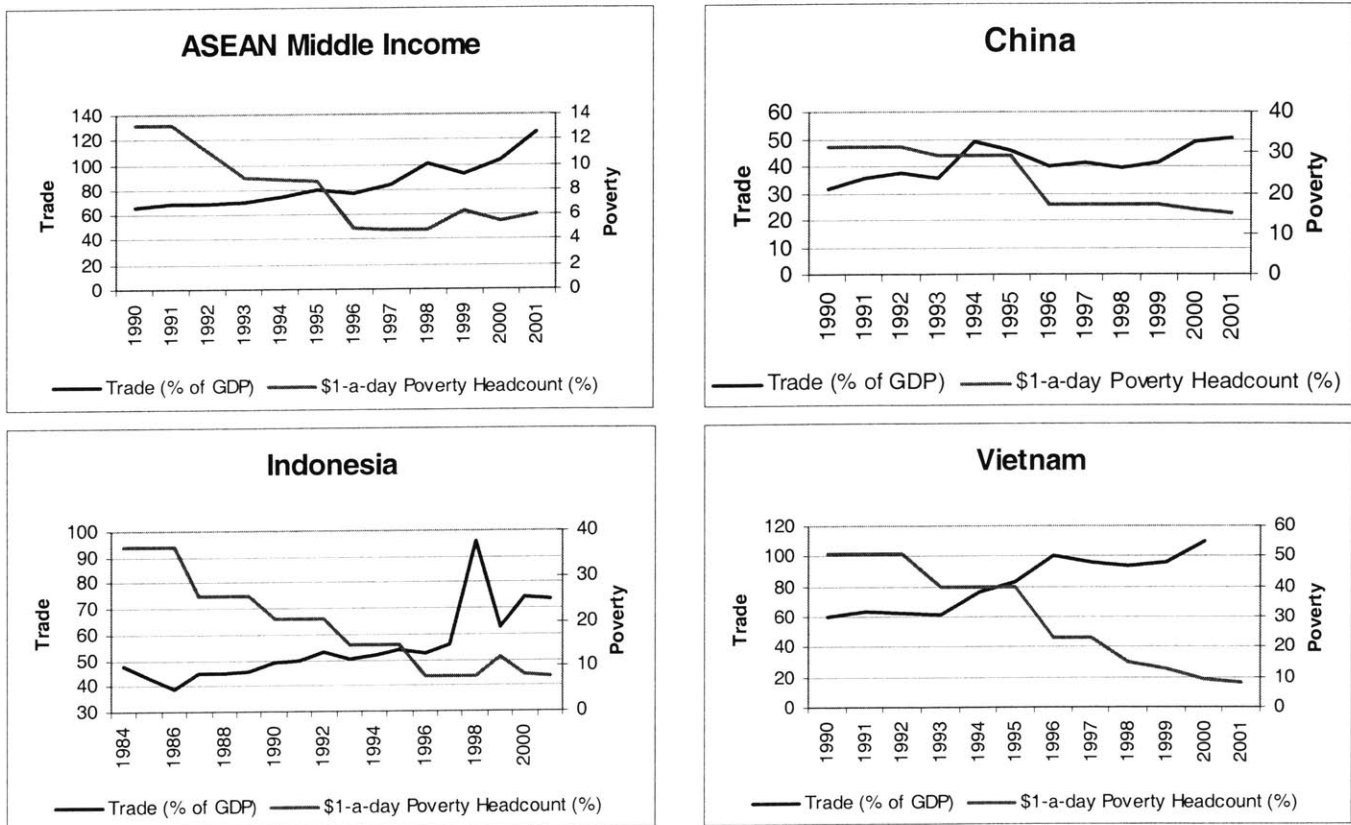
3.1 Importance of Trade for the Region

The rapid economic growth in Asia has resulted in a new geographical pattern of world production and trade. The European Union (EU), Asia, and the countries that belong to the North American Free Trade Agreement (NAFTA) dominate the world economy. Approximately 82 percent of the world's total production of goods and services and 73 percent of world exports (compared to 65 percent of exports in 1980) originated from the three blocs in 1996. The Gross Domestic Product (GDP) of the Asian countries almost doubled in the period 1980 to 1996, reaching 24 percent of the world's GDP. The EU ranks first with 30 per cent of world production followed by NAFTA with 28 per cent. Even though Asia ranks in third position, it is the second larger exporter among the three regions. [Hellvin et. al., 2000]

Trade is a very significant element of the economies in the area. As presented in the previous chapter, from an economic perspective, trade improves the macroeconomic environment of the countries and measurements of quality of life such as the GDP and the per capita income. Examples of countries that improved their poverty rate while increasing their trade growth as a percentage of the GDP are shown below in Figure 4. It appears that while the trade as a percentage of the GDP grows, there is a negative correlation with the number of people who live under the poverty level of one-dollar-a-day compensation in the area or the countries presented. At the same time, in remote

regions of East Asia there seems to be an increase in poverty, because of lack of interconnectivity with the outside world. [Krumm, 2003]

Figure 4 Trade has been a traditional hallmark of East Asia success [Krumm, 2003]



3.2 Grouping of Countries

3.2.1 ABC analysis

Asia is extremely diverse. In order to group the forty-eight countries that this study examines in the Asian region, the methodology used is an ABC analysis, as explained thoroughly in the first chapter. The countries are categorized by their level of infrastructure. Depending on the volume and importance of trade for each country, as

well as the type of commodities imported and exported, the countries are blocked in three different categories.

A first measure that was used in the analysis in order to categorize the forty-eight countries was the per capita GDP purchasing power parity. By this criterion, the countries were actually grouped in categories according to their wealth divided by their population.

The following Table presents the top of the three groups.

Table 3 Top 14 Asian Countries ranked in descending order according to their GDP ppp per capita [2002] [CIA, The World Fact book, 2004]

Country	GDP purchasing power parity per capita (2002 est.)	GDP purchasing power parity in billion \$	GDP real annual growth rate (%) (2002 est.)
Japan	\$28,700	3,651.00	0.20%
Hong Kong	\$27,200	198.50	2.30%
Singapore	\$25,200	112.40	2.20%
United Arab Emirates	\$22,100	53.97	1.80%
Qatar	\$20,100	15.91	4.60%
Korea, South	\$19,600	941.50	6.30%
Israel	\$19,500	117.40	-0.80%
Brunei	\$18,600	6.50	3%
Macau	\$18,500	8.60	9.50%
Taiwan	\$18,000	406.00	3.50%
Kuwait	\$17,500	36.85	-2%
Bahrain	\$15,100	9.91	2.90%
Saudi Arabia	\$11,400	268.90	1%
Oman	\$8,300	22.40	2.20%

From Table 3 one can notice that Japan, Honk Kong and Singapore are the top three wealthiest countries of the region. It is important for one to see the real annual growth

rate of the GDP for these countries. The developed Japan is growing marginally in comparison to the Middle Eastern countries (with an exception of Kuwait and Israel). Especially Macau, South Korea and Taiwan are experiencing high growth rates. The Table below presents the same countries as above in descending order according to the importance of trade (specifically the exports) as a percentage of the GDP.

Table 4 Top Asian Countries in descending order according to the importance of exports as a percentage of the GDP [2002] [CIA, The World Fact book, 2004]

Country	% Exports/GDP	% Imports/GDP
Singapore	113.00%	100.50%
Hong Kong	100.90%	104.80%
United Arab Emirates	83.20%	57.10%
Qatar	68.50%	24.50%
Bahrain	58.50%	42.40%
Oman	47.30%	24.60%
Brunei	46.20%	21.50%
Kuwait	43.40%	19.80%
Taiwan	32.00%	27.80%
Macau	27.40%	29.40%
Saudi Arabia	26.40%	14.70%
Israel	23.90%	26.20%
Korea, South	17.30%	15.80%
Japan	10.50%	8.00%

Table 4 is an export importance index for the top 14 countries of this analysis. The developed countries of Asia are basing a high percentage of their GDP in trade; the same happens for the Middle Eastern countries that export high-volume products (oil and petroleum products).

A similar analysis as the above follows for the second category grouped. Table 5 shows the 18 next countries of the region in descending order according to their GDP purchasing power parity per capita.

Table 5 Next 18 Asian Countries ranked in descending order according to their GDP ppp per capita [2002] [CIA, The World Fact book, 2004]

Country	GDP purchasing power parity per capita (2002 est. unless otherwise stated)	GDP purchasing power parity in billion \$	GDP real annual growth rate (%) (2002 est. unless otherwise stated)
Russia	\$9,700	1,409.00	4.30%
Malaysia	\$8,800	198.40	4.10%
Turkey	\$7,300	489.70	7.80%
Kazakhstan	\$7,200	120.00	9.50%
Thailand	\$7,000	445.80	5.30%
Iran	\$6,800	458.30	7.60%
Turkmenistan	\$6,700	31.34	21.10%
Lebanon	\$4,800	17.61	2%
China	\$4,700	5,989.00	8% (official data)
Philippines	\$4,600	379.70	4.40%
Jordan	\$4,300	22.63	4.90%
Azerbaijan	\$3,700	28.61	10.60%
Sri Lanka	\$3,700	73.70	3.20%
Syria	\$3,700	63.48	3.60%
Armenia	\$3,600	12.13	12.90%
Indonesia	\$3,100	714.20	3.70%
India	\$2,600	2,664.00	4.30%
Vietnam	\$2,300	183.80	7%

In the above Table it is important for one to see the very high annual growth rates of these developing countries. These rates are much higher than the ones of the 14 previously mentioned developed countries. From table 5 one can also notice the much

lower GDP purchasing power parity per capita which is half and in some cases one tenth of the equivalent measure in Table 3. Table 6 presents these countries in descending order according to the importance of exports as a percentage of the GDP.

Table 6 Middle Economy Asian Countries in descending order according to the importance of exports as a percentage of the GDP [2002] [CIA, The World Fact book, 2004]

Country	% Exports/GDP	% Imports/GDP
Malaysia	48.00%	38.70%
Thailand	15.20%	13.00%
Jordan	11.00%	19.40%
Syria	9.80%	7.70%
Turkmenistan	9.50%	7.20%
Philippines	9.20%	8.80%
Vietnam	9.00%	9.10%
Kazakhstan	8.60%	8.00%
Russia	7.40%	4.30%
Indonesia	7.30%	4.50%
Turkey	7.20%	10.40%
Azerbaijan	7.00%	6.30%
Sri Lanka	6.20%	7.30%
Lebanon	5.70%	34.10%
Iran	5.40%	4.80%
China	5.40%	4.90%
Armenia	4.30%	8.20%
India	1.70%	2.00%

In the above table it is noticeable that the importance of the exports in the GDP is much lower than it was for the previous category of countries, with the exception of Malaysia and Thailand. Although the countries presented in this category have a great potential for increase of production and trade, and have a wealthy land and a significant number of

working force the percentage of exports in their GDP is comparatively low. Still, there is a great interest for these countries to develop further and raise this percentage.

Finally, this part of the analysis ends with the last 16 countries shown in Table 7. As presented below, these countries have a high poverty rate in comparison to all the previously mentioned countries. The growth rates are low for developing countries and even negative in some cases. It is the economic and political instability of these countries that forces these indexes to go below zero.

Table 7 Last 16 Asian Countries ranked in descending order according to their GDP ppp per capita [2002] [CIA, The World Fact book, 2004]

Country	GDP purchasing power parity per capita (2002 est. unless otherwise stated)	GDP purchasing power parity in billion \$	GDP real annual growth rate (%) (2002 est. unless otherwise stated)
Georgia	3,200 (2001 est.)	16.05	5.40%
Pakistan	2,000 (FY01/02 est.)	295.30	4.4% (FY01/02 est.)
Kyrgyzstan	\$2,900	13.88	5.30%
Uzbekistan	\$2,600	66.06	4.20%
Iraq	\$2,400	58.00	-3%
Mongolia	\$1,900	5.06	3.90%
Laos	\$1,800	10.40	5.70%
Bangladesh	\$1,800	238.20	4.80%
Burma	\$1,700	73.69	5.30%
Cambodia	\$1,600	20.42	4.50%
Nepal	\$1,400	37.32	-0.60%
Tajikistan	\$1,300	8.48	9.10%
Bhutan	\$1,300	2.70	7.70%
Korea, North	\$1,000	22.26	1%
Yemen	\$800	15.07	4.10%
Afghanistan	\$700	19.00	NA%

In Table 8, it is important for one to notice that the exports for the poorest countries in the region have the same importance as for the countries in the previous category. With the exception of Yemen and Iraq which export oil and petroleum products that are high-value commodities, for all the other countries exports play a small role in their GDP. For these particularly poor countries the need for development is very high.

Table 8 Poorest Asian Countries in descending order according to the importance of exports as a percentage of the GDP [2002] [CIA, The World Fact book, 2004]

Country	% Exports/GDP	% Imports/GDP
Yemen	22.60%	19.20%
Iraq	22.40%	13.40%
Mongolia	9.90%	13.00%
Tajikistan	8.40%	9.80%
Cambodia	6.80%	8.50%
Afghanistan	6.30%	6.80%
Bhutan	5.70%	7.30%
Uzbekistan	4.20%	3.80%
Korea, North	3.80%	5.90%
Burma	3.70%	3.40%
Kyrgyzstan	3.50%	4.20%
Pakistan	3.30%	3.80%
Laos	3.30%	5.30%
Georgia	3.20%	4.70%
Bangladesh	2.60%	3.60%
Nepal	1.90%	4.30%

Another analysis below shows the ratio of the exports over the population of the countries. The wealthier the country is, and the higher the value of the commodities exported, that higher the ratio is.

Table 9 Ratio of exports/population in \$ [2002] [CIA, The World Fact book, 2004]

Country	Ratio of exports/population in \$	Country	Ratio of exports/population in \$	Country	Ratio of exports/population in \$
Korea, South	33,232	Philippines	42,959	Laos	734
Hong Kong	27,426	Russia	4,306	Iraq	527
United Arab Emirates	18,070	Malaysia	3,597	Korea, North	386
Saudi Arabia	15,945	Thailand	1,086	Nepal	256
Bahrain	8,693	Turkmenistan	622	Yemen	176
Brunei	8,549	Kazakhstan	614	Kyrgyzstan	131
Taiwan	5,765	Turkey	515	Pakistan	116
Israel	4,594	Jordan	458	Cambodia	108
Japan	3,023	Iran	363	Uzbekistan	108
Kuwait	2,770	Syria	353	Georgia	104
Singapore	2,628	Azerbaijan	255	Tajikistan	103
Macau	870	China	254	Qatar	75
		Sri Lanka	233	Bhutan	72
		Indonesia	229	Oman	70
		Vietnam	203	Burma	64
		Armenia	158	Bangladesh	45
				Lebanon	44
				India	42
				Afghanistan	42
				Mongolia	22

Finally, in the Tables 10, 11, and 12 below one can see the countries of the three categories divided by commodities that they export and import. It is noticeable that the wealthy countries export either petroleum and its products, or electronics and machinery and equipment (highest value commodities). Singapore, Hong Kong, Taiwan Japan,

South Korea, Brunei, Thailand and Malaysia have either no agricultural sector or its share in the GDP is insignificant. [CIA, The World Fact book, 2004] and [Fuchs, 2003]

Table 10 Developed Asian countries ranked by their export commodities (import also mentioned) [2002] [CIA, The World Fact book, 2004]

Country	Exports - commodities	Imports - commodities
Japan	motors, electronics	machinery
Singapore	machinery, electronics	machinery
Taiwan	machinery and electrical equipment	machinery and electrical equipment
Israel	machinery	raw materials
Hong Kong	electrical machinery	agricultural products, raw materials, semi manufactures, petroleum, plastics, machinery, electrical equipment; a large share is reexported
Korea, South	electronic products	machinery
Brunei	crude oil	machinery
United Arab Emirates	crude oil	machinery
Macau	clothing, textiles	clothing, textiles
Saudi Arabia	petroleum	machinery
Bahrain	petroleum	crude oil, machinery, chemicals
Oman	petroleum	machinery
Qatar	petroleum products	machinery
Kuwait	oil and refined products	food, construction materials

The countries that belong in the middle category export either consumer goods, textiles, land extracts including scrap metal, mineral products and chemicals, or finished goods that they have first imported as semi-finished (lower value commodities) in Table 11. The commonalities among this category and the other two is that all countries need at some point to import machinery and equipment; even highly developed ones.

Table 11 Rapidly Developing Asian Countries Ranked by Their Export Commodities (import also mentioned) [2002] [CIA, The World Fact book, 2004]

Country	Exports - commodities	Imports - commodities
China	machinery	machinery
Armenia	land extracts	petroleum
Malaysia	electronic equipment, petroleum	electronics, machinery
Philippines	electronic equipment, machinery	raw materials, machinery
Vietnam	crude oil, agricultural products	machinery
Turkmenistan	gas	machinery
Indonesia	oil and gas, electrical appliances	machinery
Azerbaijan	oil and gas 90%	machinery
Kazakhstan	oil	machinery
Syria	crude oil	machinery
Russia	petroleum and petroleum products	machinery and equipment, consumer goods
Iran	petroleum	industrial raw materials and intermediate goods
Thailand	computers, transistors	capital goods, intermediate goods and raw materials
Turkey	apparel, agricultural products, textiles	machinery, chemicals, semi-finished goods
Sri Lanka	textiles and apparel	textiles
India	textile goods	crude oil, machinery
Lebanon	agricultural products	machinery
Jordan	agricultural products	crude oil, machinery

The poor countries export mainly agricultural products, including grain, timber, cotton, fruits, vegetables, rice, and coffee (lowest value commodities) in Table 12.

Table 12 Slowly Developing Asian Countries Ranked by their Export Commodities (import also mentioned) [2002] [CIA, The World Fact book, 2004]

Country	Exports - commodities	Imports - commodities
Georgia	land extracts	fuels, machinery
Korea, North	land extracts	petroleum
Mongolia	land extracts	machinery
Tajikistan	land extracts	electricity, petroleum products
Nepal	clothing	machinery

Pakistan	textiles, agricultural products	petroleum
Afghanistan	agricultural products	capital goods
Bangladesh	agricultural products	machinery
Bhutan	agricultural products	fuel and lubricants
Burma	agricultural products	machinery
Cambodia	agricultural products	petroleum products
Kyrgyzstan	agricultural products	oil and gas, machinery
Laos	agricultural products	machinery
Uzbekistan	agricultural products	machinery
Yemen	crude oil, agricultural products	agricultural products
Iraq	crude oil	food, medicine

All the above data reflect directly to the transportation and logistical infrastructure of the forty-eight countries. The forthcoming analysis does not intend to be purely economical but to state the correlation that exists between the level of infrastructure and trade for the countries in the region.

3.2.2 “A” countries

The “A” countries are 14 in the number as mentioned in the previous section of the chapter. Japan, Singapore, Hong Kong and Macau (both examined separately from China, as special administrative zones, neighboring with special economic regions), South Korea, Israel, and Taiwan are the countries included in this category; also Kuwait, the United Arab Emirates, Saudi Arabia, Bahrain, Oman, Qatar, and Brunei which are crude oil producing countries which is a synonym to wealth for their economy.

These are countries that seem to have a comparatively developed or very rapidly developing network of facilities with little flaws. Road transportation and rail transportation, wherever it is applicable, is modernized and improving with a steady rate.

These countries are mainly producing and trading electronics, and high-technology and value products that are time sensitive. The logistical infrastructure is often installed and operated by third party logistics or mature and successful companies of the West World.

Most of the above countries have the entire needed infrastructure in place, and are leading economies, and great examples for the rest. These countries simply need to keep up with the fluctuation of demand and be flexible by adopting change techniques in order to stay at the top of the competition. Sometimes these countries also need to use additional technologically advanced tools so as to improve the quality of life of the habitants (lower the travel times in urban transportation, improve the quality of the air in the congested areas), as well as maximize the utility of the restricted capacity that they have in order to respond to the demand of the market (the developed countries are small in size and have capacity limitations, see Japan, Taiwan, Singapore, Hong Kong).

Some of the above countries have a great industry (South Korea, Japan and Taiwan) and some others are simply operating as freight villages (hubs) like Singapore and Hong Kong. Hong Kong is not amongst the countries with the extremely high industrial sector because its role has been the gateway of China's trade for many decades. [CIA, The World Fact book, 2004] and [Fuchs, 2003]

In the Middle Eastern countries of this category it is surprising that we see undeveloped highway or railway network, but this can be explained by their geographic position, that

might not allow infrastructure development in a desert but only by the sea where life exists and ports are the countries' gateway.

The common characteristic of all the above countries is that they are comparatively smaller than the other ones in the region (Russia, China) and it has been easier for them to build infrastructure. This analysis does not examine Australia and New Zealand in the Pacific.

3.2.3 “B” countries

The “B” countries are the 18 countries that appeared to be developing but as it will be shown later on, in chapter four, are behind in infrastructure development that will give them a leading position in the global economic competition. “B” countries are China (excluding Hong Kong and Macau), Malaysia, Philippines, Indonesia, Thailand, Russia, Vietnam, India, Kazakhstan, Azerbaijan, Armenia, Turkmenistan, Syria, Iran, Turkey, Sri Lanka, Jordan and Lebanon. These countries are mostly great countries that are trying to improve their infrastructure for the past decades (China, Russia, India, Indonesia, Malaysia, and Pakistan) or smaller countries like the Philippines, Thailand, Vietnam, and Laos that have not been accepting Foreign Direct Investment historically, and concentrate on less technology-oriented production and more man-intensive industry, such as agriculture and the textile industry. In that category there belong some of the developing countries that were created after the collapse of the former Soviet Union (Kazakhstan, Azerbaijan, Armenia, and Turkmenistan) and Turkey that is trying to enter the European Union.

The above countries currently have some of the transportation network components developed but lack the complete coordination of the network or some of the modes that are necessary for the optimal and complete function of the system. These countries are in the process of attracting funds from international organizations and try to create a niche in the area. Trade for these countries is an important means that will make them more competitive and give them a new role internationally. Foreign investment has been or currently is seriously considered in these countries.

The share of gross domestic product from the industrial sector reaches up to 50% in countries such as China, Indonesia, Malaysia, Thailand, Vietnam, and Philippines. These countries need the transportation and logistical infrastructure development in order to export their products more efficiently.

Technology world ranking for the Asian countries gives leadership to Singapore, Hong Kong, Taiwan, Japan, Malaysia, and South Korea. Thailand, China, Vietnam, Indonesia and the Philippines follow with lower positions. [World Economic Forum]

In the Business efficiency world ranking [Coyle, 2003], companies in the countries of Singapore, Hong Kong, Taiwan, Malaysia, South Korea and Japan are better than these placed in China, Philippines and Indonesia. [United Nations Conference on Trade and Development]

Finally, the company operations and strategy ranking indicates that Japan, Singapore, Taiwan, South Korea, Hong Kong and Malaysia are much higher than Thailand, China, Philippines, Vietnam and Indonesia. [World Economic Forum]

3.2.4 “C” and intermediate countries

The “C” countries are 16, including the intermediate ones. These are Afghanistan, Georgia, Pakistan, Kyrgyzstan, Tajikistan, Iraq, Uzbekistan, Mongolia, Yemen, Laos, North Korea, Bangladesh, Bhutan, Nepal, Burma, and Cambodia. These countries seem to have under-developed transportation and logistical network and small shares of trade in the region. Some of these countries have a high development rate and seem to be interested in integration (Bangladesh, Burma, and Cambodia) but others are having political instabilities in the area (Afghanistan and North Korea). Georgia, Kyrgyzstan, Tajikistan, and Uzbekistan are less developed than the other former Soviet Union countries mentioned in the previous category.

The above countries in their majority remain with a primitive infrastructure, and limited external and internal telecommunications. In some cases (Laos) electricity is available in only a few urban areas. The share of Gross Domestic Product from the agricultural sector is particularly high for small countries such as Laos, Cambodia and Burma.

Moreover, the countries that belong to category C are slowly developing countries that have serious problems in their infrastructure because they have had political instability over the past years and lack the funds and organization for improvement. Finally, in that

category there belong countries that might not need infrastructure in order to export their products or import from their neighbors but their country's strategic positioning makes it imperative for them to have an at least basic, functional and acceptable network in order to facilitate international trade. These countries are called intermediate countries.

In Table 13 one can see the 48 countries of this study divided in the three categories.

Table 13 ABC countries

"A" countries	"B" countries	"C" countries
Japan	China	Afghanistan,
Singapore	Malaysia	Georgia
Hong Kong	Philippines	Pakistan
Macau	Indonesia	Kyrgyzstan
South Korea	Thailand	Tajikistan
Israel	Russia	Iraq
Taiwan	Vietnam	Uzbekistan
Kuwait	India	Mongolia
United Arab Emirates	Kazakhstan	Yemen
Saudi Arabia	Azerbaijan	Laos
Bahrain	Armenia	North Korea
Oman	Turkmenistan	Bangladesh
Qatar	Syria	Bhutan
Brunei	Iran	Nepal
	Turkey	Burma
	Sri Lanka	Cambodia
	Jordan	
	Lebanon	

3.3 Summary

It is not easy to compare a country that is 17 million square kilometers with one that is less than a thousand square kilometers (Bahrain). It is also very tricky to compare a country that exports petroleum (United Arab Emirates) or electronics (Japan) that are high-volume and expensive products respectively with countries that mainly export low-volume products, such as carpets (Nepal) or garments (Bangladesh). Japan, China, Hong Kong, South Korea, Taiwan, Singapore, Russia, Malaysia, Saudi Arabia, Thailand, Indonesia, United Arab Emirates, India, and Philippines are the leading countries in export and import volumes. It is very impressive to see that a country like South Korea or Japan exports and imports products of almost the same value as China and Russia. Obviously the nature of the products and their value is different.

It appears that trade accounts for a very significant ratio of the GDP for several countries. Singapore, Hong Kong, United Arab Emirates, Qatar, Bahrain, Malaysia, Oman, Brunei, Kuwait, Taiwan, Macau, and Saudi Arabia are the countries with the best economies in the region. The leading position is in the hands of either countries that are trading by definition and service bigger nations around them (Singapore, Hong Kong, Taiwan, Macau) or in the hands of countries that are trading petroleum (United Arab Emirates, Qatar, Bahrain, Oman, Brunei, Kuwait, Saudi Arabia).

China, Japan, India, Russia, South Korea, Indonesia, Turkey, Iran, Thailand, Taiwan, Philippines, and Pakistan are the countries with the highest GDP in the analysis. With the exception of Japan, South Korea and Taiwan that are in good shape indeed, the rest of the

countries mentioned above might seem wealthy but are enormous and their infrastructure needs are huge.

Countries such as Afghanistan, Georgia, Pakistan, Kyrgyzstan, Tajikistan, Iraq, Yemen, Uzbekistan, Mongolia, Yemen, Laos, North Korea, Bangladesh, Bhutan, Nepal, Sri Lanka, Burma, and Cambodia are not in good shape as far as their infrastructure is concerned. They also lack coordination with their neighboring countries. It is of interest not only for these countries but also for the world community to build a basic transportation infrastructure that will permit the communication from, to, and through these mostly centrally placed countries.

All the above countries in the three groups are going to be evaluated in the next chapter and their infrastructure is going to be examined thoroughly for the major transportation modes.

Chapter Four: Necessity of Infrastructural Improvement

4.1 Understanding of the Problem

One main aspect of economic development in the end of the 20th century has been the globalization of markets. This resulted in increased demand for the unlimited movement of people, goods and services. The phenomenon of the “The East Asian Miracle”, the “Asian Four Tigers”, namely, Hong Kong, Singapore, South Korea, and Taiwan replied to the new trend successfully. These countries managed to contribute from their part to safe and reliable international transport routes and networks, as well as efficient management of the infrastructure including the software and paperwork needed for a continuous flow of trade.

The overall competitiveness in a global economy is limited when transport services are inadequate. Improved transportation and logistical infrastructure in the “centers of evolution”, in Megacities and huge economic centers do not always bring the desirable result, unless the peripheral development allows the existence of a well developed network as a whole. This has encouraged the physical development of infrastructure internationally in order to accommodate the increase in trade.

The wide recognition of the need and importance of a well-developed transportation network, according to a report published from the UNESCAP, in 2002, combined with

improved political stability in most parts of the Asian continent, led the involved countries to express a common desire to try harder to improve the infrastructure and connect the various fragmented national networks to form regional and sub-regional transport systems.

An example of the recognition is the fact that officials in developing countries, in both continents, realize the need for modernization of the infrastructure and technical upgrade. In meetings, they often decide to make progresses and increase the capacity and the efficiency of the transportation systems. They also recognize the need for coherent, interconnected and harmonized development of transport infrastructure. They declare their willingness to work on the development of transport projects and financial support for their implementation.

Their decisions also include the elimination of physical and non-physical obstacles to passage of freight flow between the countries, the coordinated tariff/price policy for future creation of through tariff system, and the simplification of border procedures. They understand the need for development of combined transportation, and the creation of logistic systems and means of information tracking of cargo delivery. Finally they have a vision of coordination and financial support of joint scientific research of interaction of transport systems, logistical, ecological and safety-related problems. [Kyiv Declaration, 2002] and [Declaration, St. Petersburg, 1998]

The next few sections address the different modes of transportation and the level of infrastructure for the countries in the three categories.

4.2 Facilities Needed for the Support of Better Integrated Channels and Networks

4.2.1 Urban transportation

As mentioned earlier, Asia faces the phenomenon of Megacities creation. The rapid growth of cities has led to increased demand for urban transport facilities. Sometimes this expansion has occurred with little or no development planning and many cities in the region are facing serious problems, including congestion, pollution, accidents and inadequate access by disadvantaged groups. [UNESCAP, 2001]

Bangkok, Beijing, Guangzhou, Incheon, Kolkata, Bombay, Delhi, Dhaka, Karachi, Seoul, Tehran, Kuala Lumpur, Jakarta, Manila, Busan, Shanghai, Daegu, and Tianjin are some of the cities that face a large growth of motor vehicle population. The modal share of public urban transport in these developing cities is lower compared to the developed cities of Hong Kong, Singapore, and Tokyo. [UNESCAP, 2001]

Although Intelligent Transportation Systems (ITS) technology can be introduced in the “A” countries in order to improve congestion, the environment and the quality of life, the solution to the urbanization and high congestion problem is different for the poorest countries. An integrated urban infrastructure development with clear incentives is needed, as well as the decentralization of planning and management responsibilities and resources to local governments. [Singh et. al., 1996]

Generally speaking, it is very important that the decisions concerning urban transportation development are well supported with demand analysis and forecasting techniques, as well as space utilization analysis because the project can fail by the time it will be implemented. External assistance needs to be designed carefully to avoid sustainability problems.

Some of the “B” countries have substantial urban transportation infrastructure, Malaysia and Thailand. Still, the cities of Kuala Lumpur and Bangkok are developing along with the rest of the countries and more sophisticated infrastructure will be needed in the future.

The urban transportation infrastructure in the countries that belong to category “B”, in contrast to the commonalities that all of them have in the level of infrastructure of the rest of the modes, is not too much alike. Countries such as India, Indonesia, the Philippines, Vietnam, and Turkey have more serious problems that cannot be compared to Malaysia and Thailand. In these countries trams, subways or elevated trains are missing and the bus service is not in a good shape.

ITS cannot be the solution for the “C” countries either. A basic urban transportation infrastructure is missing, along with paved roads for the mass transportation to operate on. Even the bicycles themselves create congestion in cities that belong to the “C” countries. There has been no design or urban planning in most of the cases and the frequently old-technology cars that exist create jams and pollution. A basic infrastructure

should be considered and placed in “C” countries. Policy measures such as taxation for vehicles and gas can be taken into consideration as well.

4.2.2 Road transportation

An efficient road transportation system and effective cross-border cooperation are essential for road transport, in order to contribute toward regional cooperation while reducing travel cost. [Asian Development Bank, 2000] Road safety is a serious aspect of the road infrastructure because more than 400,000 people are killed annually by road accidents and several millions are injured in the Asian region. [UNESCAP, 2001]

The size and the expansion of the road networks in Asia have been characterized by relatively slow growth. The networks of many developing countries grew at rates averaging less than one per cent per year over the past five years. [UNESCAP, 2001] Moreover, the percentage of paved road kilometers shows little improvement. In the following Tables 14 through 16, the Asian countries' highways' length in comparison to their size (density) is shown. The “A” countries are mostly small countries with extensive highway network. Their pavement ratio is high (100% some of the times) with the exception of the Middle Eastern countries. The reason why these countries lack extensive highway networks is not because they are poor, but because they are in a region where environmental conditions do not allow extensive road transportation. They are all placed by the sea, thus the lack of extensive highway network does not deprive throughways to other countries. They mostly utilize their pipelines or have extensive port facilities in order to transport their exports, which are purely petroleum and gas. There is no

agriculture or industry in these areas.

Table 14 Asian countries in category "A" highways' length and pavement ratio in descending order by the density in km/sq km [CIA, The World Fact book, 2004]

Country	Land area (sq km)	Highways, length (km)	Highways, pavement ratio	Express ways, length (km)	Population in million	Highway density km/sq km	Highway density km/1,000 people	Paved highway density km/sq km	Paved highway density km/1,000 people	Year
Macau	25	271	100%	-	0.47	1084%	58%	1084%	58%	2000
Bahrain	665	3,261	78%	-	0.67	490%	489%	382%	381%	2000
Singapore	693	3,066	100%	150	4.45	442%	69%	442%	69%	1999
Japan	377,835	1,161,894	46%	6,455	126.97	308%	915%	141%	421%	1999
Hong Kong	1,092	1,831	100%	-	7.30	168%	25%	168%	25%	1999 est.
Taiwan	35,980	35,931	88%	608	22.55	100%	159%	88%	140%	2000
South Korea	98,480	86,990	75%	1,996	48.32	88%	180%	66%	135%	1999 est.
Israel	20,770	16,281	100%	56	6.12	78%	266%	78%	266%	2000
Brunei	5,770	2,525	100%	-	0.35	44%	720%	44%	720%	2000
Kuwait	17,820	4,450	81%	-	2.18	25%	204%	20%	165%	1999 est.
Qatar	11,437	1,230	90%	-	0.82	11%	151%	10%	135%	1999 est.
Bhutan	47,000	3,690	61%	-	2.14	8%	172%	5%	105%	1999 est.
Saudi Arabia	1,960,582	151,470	30%	-	24.29	8%	623%	2%	187%	1999
UAE	82,880	1,088	100%	253	2.48	1%	44%	1%	44%	1999 est.

As one can see in Figure 6, the pavement ratio in the "A" countries is also particularly high (reaching almost up to eleven times km of paved roads per sq km of land area), in comparison to the countries that belong to the "B" and "C" category. The reason why this analysis focuses on the paved highways is because they are imperative for the efficient transportation of commodities and people on the road. The unpaved roads cannot be easily chosen over other modes of transport and are not to be used regularly by trucks as basic or alternative transportation routes. Even when the road network is there,

sometimes its condition does not allow carriers to choose it and does not facilitate trade (unpaved roads).

Figure 5 Road infrastructure in "A" countries in Asia

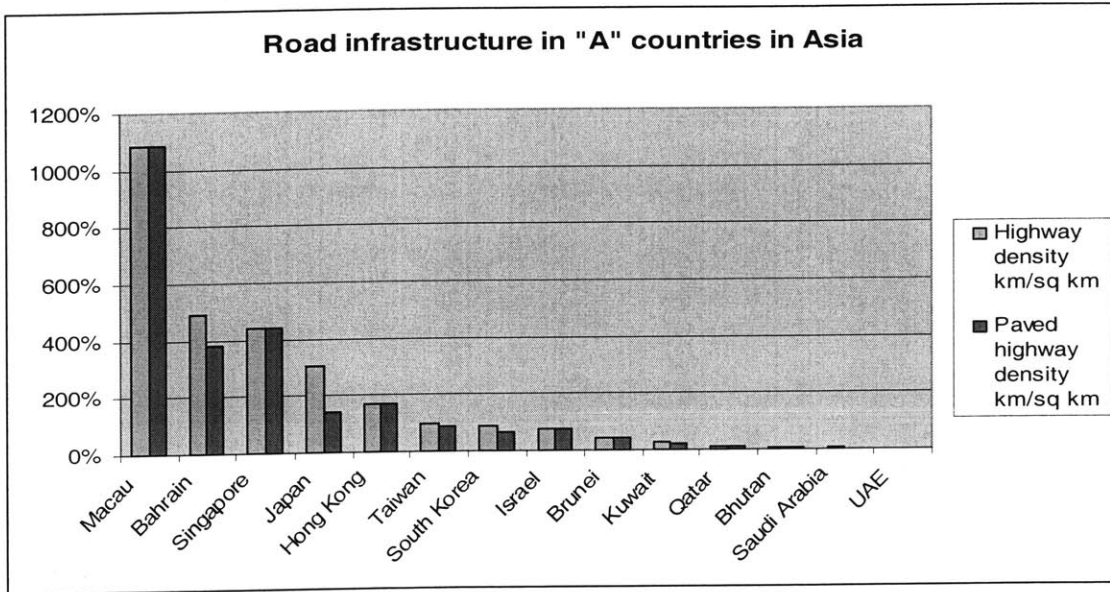


Figure 6 Highways, pavement ration in "A" countries

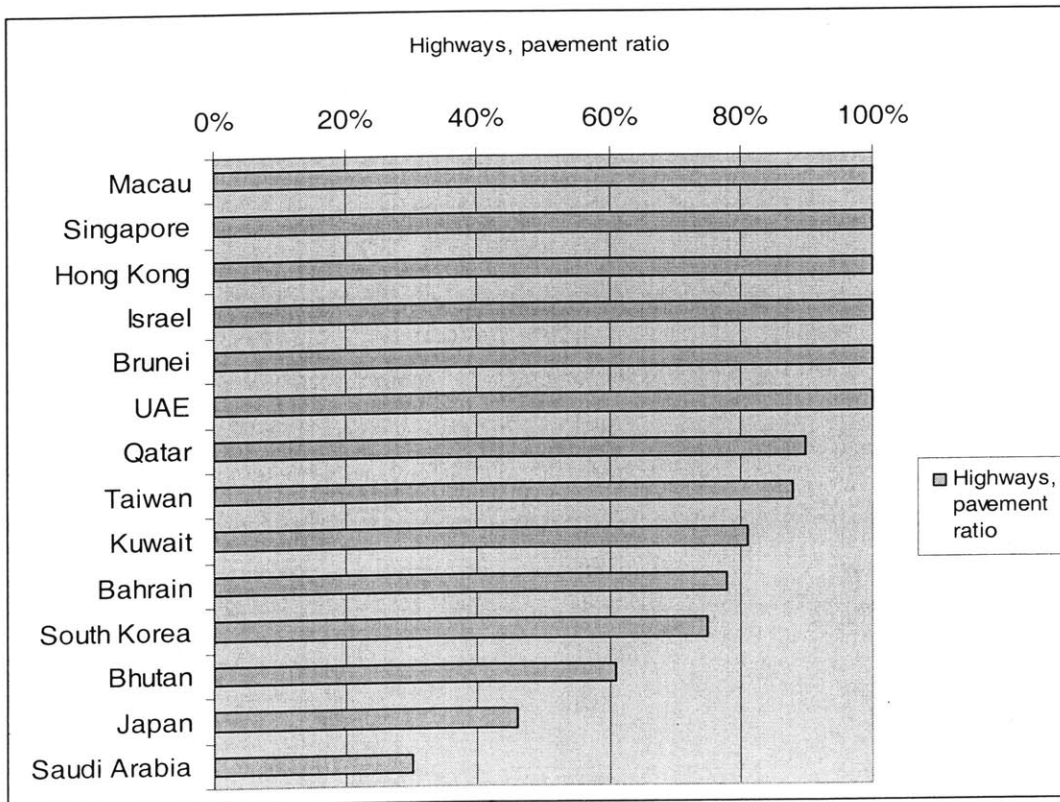


Table 15 Asian countries in category "B" highways' length and pavement ratio in descending order by the density in km/sq km [CIA, The World Fact book, 2004]

Country	Land area (sq km)	Highways, length (km)	Highways, pavement ratio	Express ways, length (km)	Population in million	Highway density km/sq km	Highway density km/1,000 people	Paved highway density km/sq km	Paved highway density km/1,000 people	Year
Sri Lanka	65,610	96,695	95%	-	19.74	147%	490%	140%	465%	1999
India	3,287,590	3,319,644	46%	-	1,049.70	101%	316%	46%	145%	1999 est.
Lebanon	10,400	7,300	85%	-	3.73	70%	196%	60%	166%	1999 est.
Philippines	300,000	201,994	21%	-	84.53	67%	239%	14%	50%	2000
Armenia	29,800	15,918	96%	7,527	3.33	53%	479%	51%	459%	2000
Turkey	780,580	385,960	34%	1,749	68.11	49%	567%	17%	193%	1999
Azerbaijan	86,600	24,981	92%	-	7.83	29%	319%	27%	293%	2000
Viet Nam	329,560	93,300	25%	-	81.10	28%	115%	7%	29%	1999 est.
Syria	185,180	43,381	23%	877	17.59	23%	247%	5%	57%	1999
Malaysia	329,750	65,877	76%	1,192	22.66	20%	291%	15%	221%	1999
Indonesia	1,919,440	342,700	46%	-	228.44	18%	150%	8%	69%	1999 est.
Oman	212,460	34,965	28%	550	2.81	16%	1246%	5%	349%	2001
China	9,596,960	1,402,698	22%	16,314	1,284.30	15%	109%	3%	24%	2000
Thailand	514,000	64,600	98%	-	62.35	13%	104%	12%	102%	1999 est.
Iran	1,648,000	167,157	56%	890	68.28	10%	245%	6%	137%	1998
Jordan	92,300	7,245	100%	-	5.46	8%	133%	8%	133%	2000
Turkmenistan	488,100	24,000	81%	-	4.78	5%	503%	4%	407%	1999 est.
Kazakhstan	2,717,300	81,331	95%	-	16.76	3%	485%	3%	461%	2000

The "B" countries of the region rarely reach a density as high as the "A" countries. With the exception of Sri Lanka, Armenia and India that base their transportation a lot on roads (even passenger transportation), and Lebanon that is a small Middle Eastern country, all the other countries have poorer highway infrastructure and mostly significantly high unpaved network. Figures 7 and 8 show them in detail. A lot of these countries are large and the low ratio can be translated as poor connectivity within the countries regions. It

also means that these countries do not offer a well-developed network, and a trustworthy way for other countries' commodities to be transferred through.

Figure 7 Road infrastructure in "B" countries in Asia

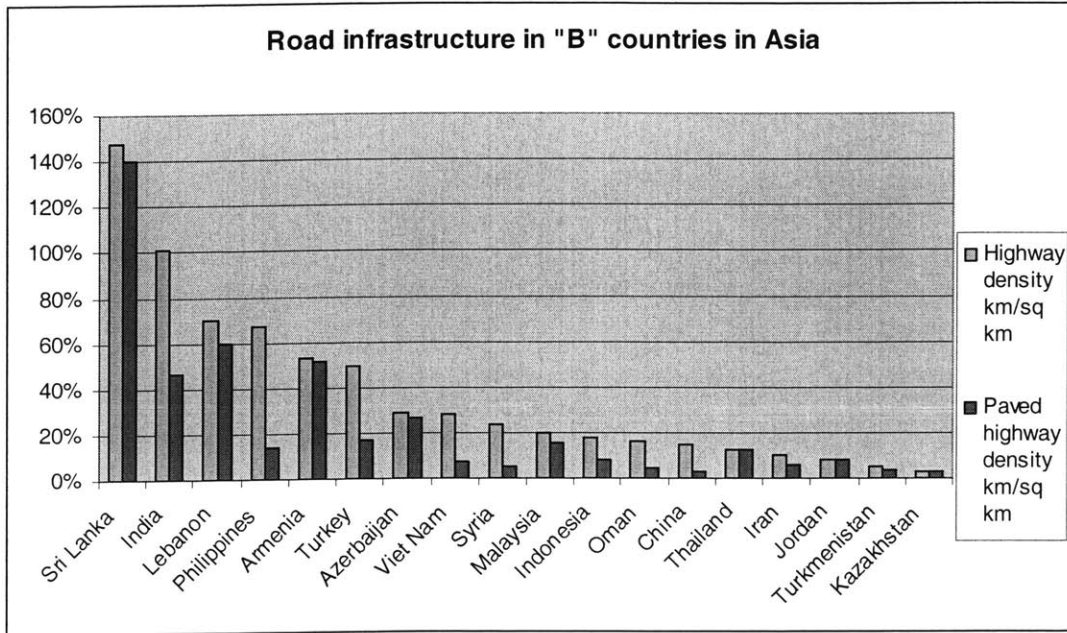
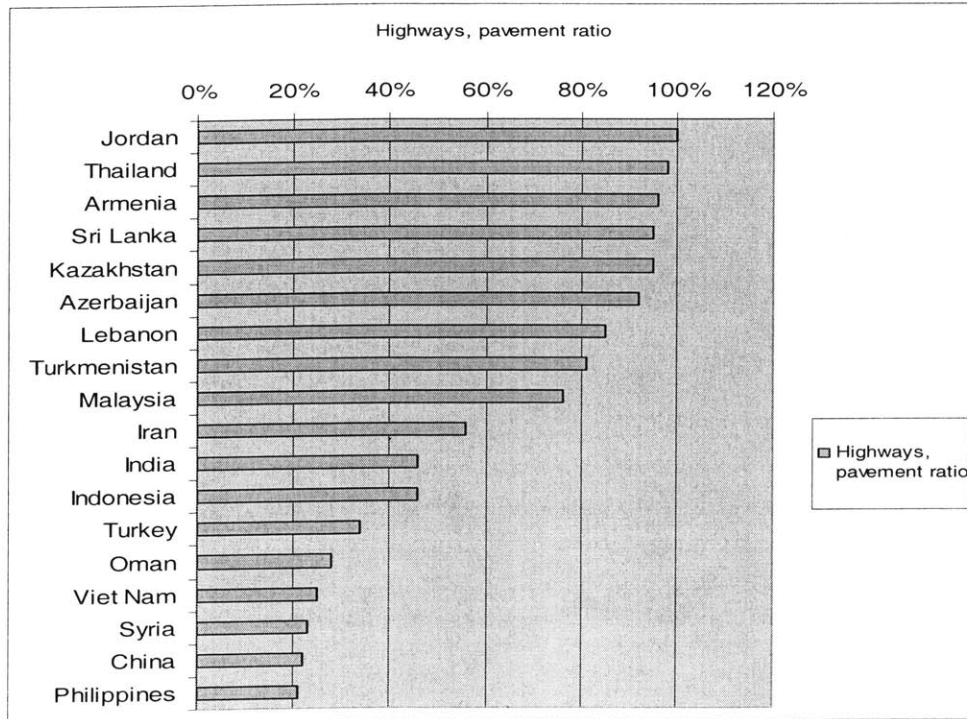


Figure 8 Highways, pavement ratio in "B" countries

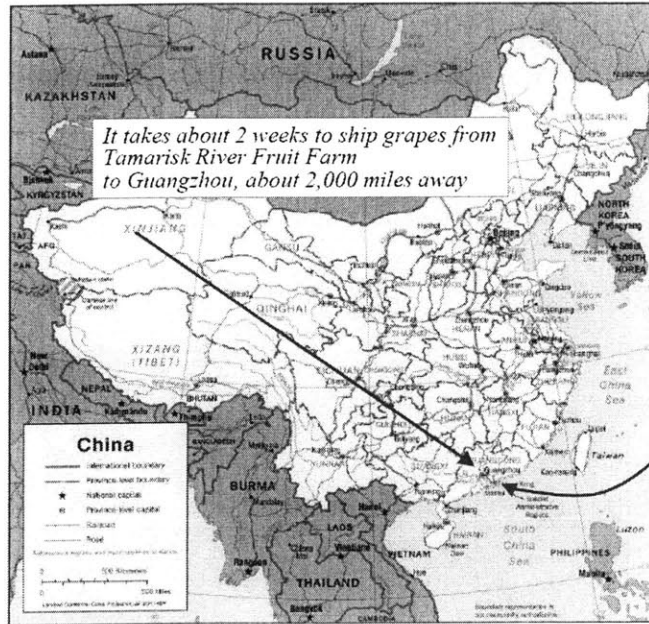


Smaller countries such as Singapore, Brunei, Hong Kong, UAE, and Macau have 100% pavement ratio, while other small developing countries such as Philippines, Cambodia, Afghanistan, Yemen, Burma, Bangladesh, and North Korea have a very low one. It is vital though to mention that the road transportation is mostly important in big countries such as India, China and Russia that require an intercity highway system. Small countries such as Hong Kong or Macau require a lower volume system; an urban transportation instead. When the distances that need to be covered are longer, the need for an option of a carrier to choose the road in order to transport products is more important. India seems to have a much better road transportation network than China, and thus China needs to pay special attention and improve further.

Corridors between the Central Asian republics and Xinjiang are limited, because of the previous hostile relationship between the Soviet Union and China. Moreover the mountainous conditions of the area restricted even further the passage between Central Asia and South Asia. The former economic integration of the Central Asian republics within the Soviet Union drove their transportation infrastructure toward European Russia (Moscow) so as to serve the important Soviet economy and links with neighboring countries had no priority. [ADB, 2004]

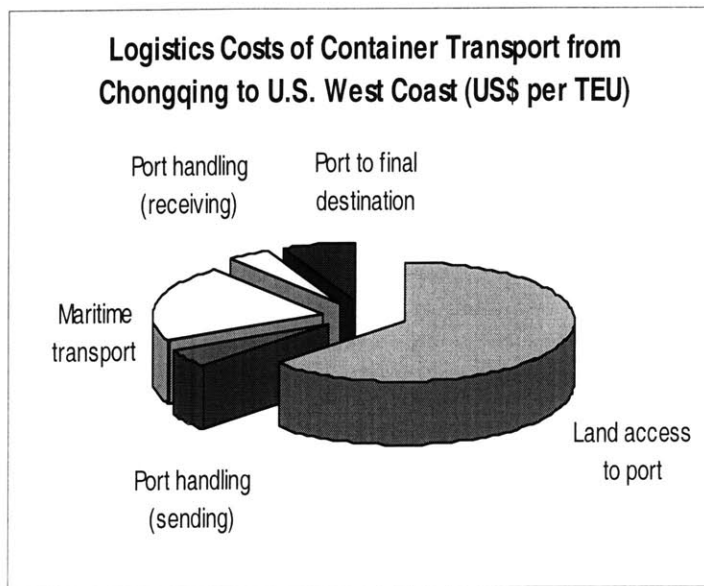
An example of the insufficient infrastructure is shown in the figure below, where it takes about the same time to ship California grapes to Guangzhou, more than 3 times the distance, about 7,500 miles.

Figure 9 Road transportation fails to deliver on time [Coyle, 2003 Source: Washington Post, Nov. 11, 2001]



Additionally, Figure 26 that indicates the expensive land access to port cost that reach 60% of the total logistical costs.

Figure 10 Logistics Costs of Container Transport from Chongqing to U.S. West Coast (US\$ per TEU) [Krumm, 2003]



In Table 16, one can see the equivalent analysis as above; this time for the “C” countries of the region. In these countries, the highway density is particularly low.

With the exception of Bangladesh that has a high percentage of unpaved roads but still very few of which are paved, the paved highway ratio does not allow efficient transportation through it. Even the countries that were created after the collapse of the formerly rich Soviet Union have a very low highway density. The length of paved highways for these often large (Russia) and intermediate countries (Afghanistan, Uzbekistan, Tajikistan, Kyrgyzstan, Iraq) imperatively needs to increase.

The current highway infrastructure in the former Soviet Union countries was developed as a regional network without taking into consideration the administrative boundaries of the currently separated countries and paid little attention to the regional economic cooperation outside of the Council for Mutual Economic Assistance countries. The network was basically designed to serve traffic within the former Soviet Union. Various newly-independent countries own fragmented transport networks that frequently cross and recross the borders of neighboring countries. [Engel, 1998]

Table 16 Asian countries in category "C" highways' length and pavement ratio in descending order by the density in km/sq km [CIA, The World Fact book, 2004]

Country	Land area (sq km)	Highways, length (km)	Highways, pavement ratio	Expressways, length (km)	Population in million	Highway density km/sq km	Highway density km/1,000 people	Paved highway density km/sq km	Paved highway density km/1,000 people	Year
Bangladesh	144,000	207,486	10%	-	138.45	144%	150%	14%	15%	1999
Pakistan	803,940	254,410	43%	339	150.69	32%	169%	14%	73%	1999
Georgia	69,700	20,362	93%	-	4.93	29%	413%	27%	384%	2000
North Korea	120,540	31,200	6%	-	22.47	26%	139%	2%	8%	1999 est.
Tajikistan	143,100	27,767	-	-	6.86	19%	405%	-	-	-
Uzbekistan	447,400	81,600	87%	-	25.98	18%	314%	16%	273%	1999 est.
Yemen	527,970	67,000	12%	-	19.35	13%	346%	2%	42%	1999 est.
Iraq	437,072	45,550	84%	-	24.68	10%	185%	9%	155%	2000 est.
Nepal	140,800	13,223	31%	-	26.47	9%	50%	3%	15%	1999 est.
Kyrgyzstan	198,500	18,500	91%	140	4.89	9%	378%	8%	344%	1999 est.
Laos	236,800	21,716	45%	-	5.78	9%	376%	4%	169%	1999 est.
Cambodia	181,040	12,323	16%	-	12.78	7%	96%	1%	15%	2000 est.
Burma	678,500	28,200	12%	-	42.24	4%	67%	0%	8%	1996 est.
Afghanistan	647,500	21,000	13%	-	28.72	3%	73%	0%	10%	1999 est.
Mongolia	1,565,000	49,250	4%	-	2.71	3%	1816%	0%	73%	2000
Russia	17,075,200	532,393	67%	-	144.53	3%	368%	2%	247%	2000

Figure 11 Road infrastructure in “C” countries in Asia

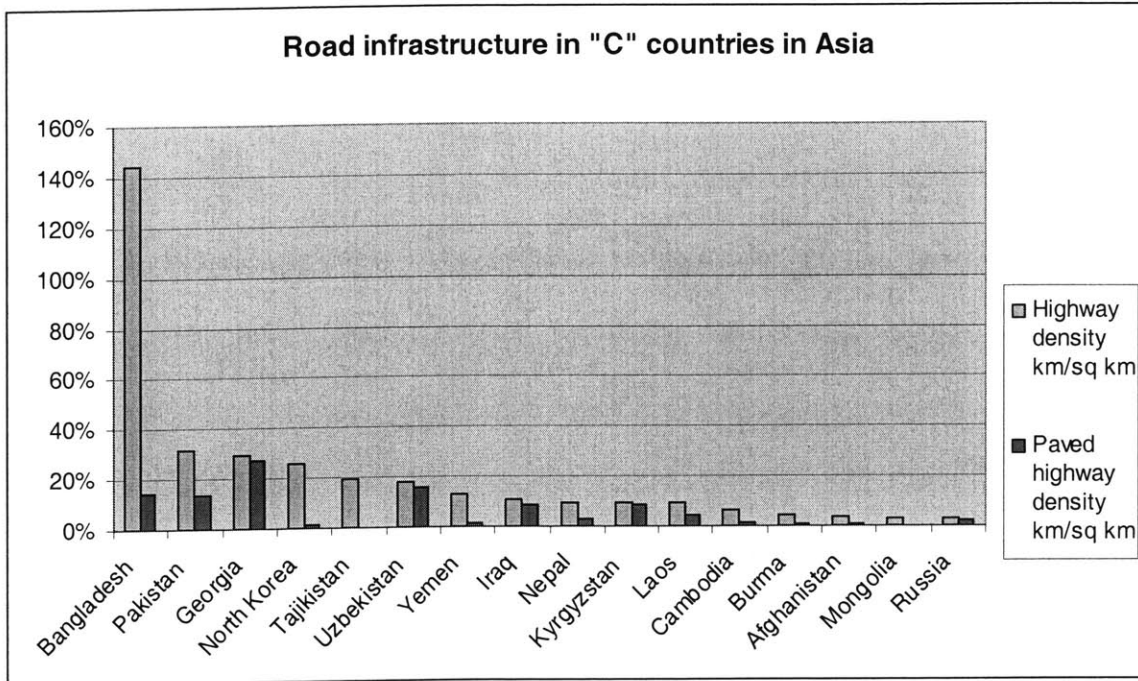
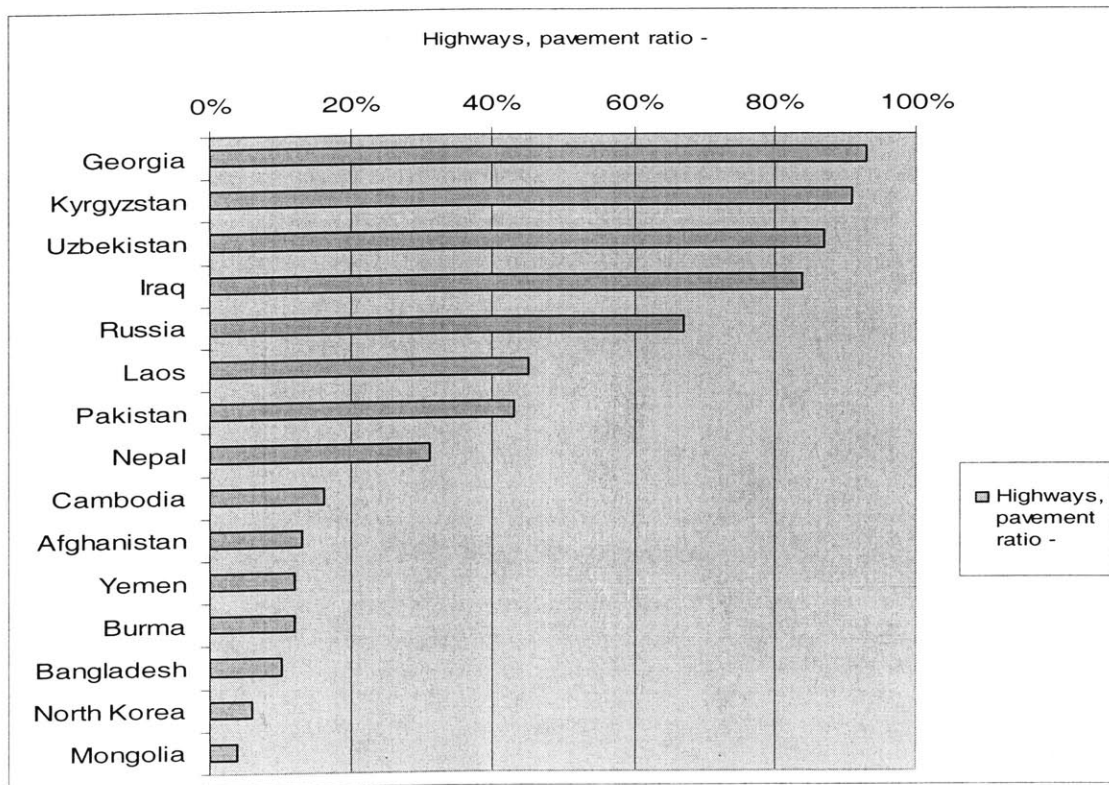


Figure 12 Highways, pavement ration in “C” countries



For Figures 11 and 12 there were no data for Tajikistan. “C” countries such as Mongolia, North Korea, Iraq, Afghanistan, Nepal, Pakistan and the former Soviet Union countries, by implementing an acceptable road infrastructure, can also facilitate their neighboring countries and interconnect with the networks.

A highway route was proposed by the United Nations and is shown in Figure 13. This is the equivalent of an interstate highway that intends to connect and service at least all the capitals of the countries in the regions and link them together. With more attention to the following more detailed maps (Figures 14 to 21), one can notice that what the Asian highway will be consisting of five major North-to-South and three East-to-West arteries.

Figure 13 Proposed Asian Highway Route [UNESCAP, 2003]

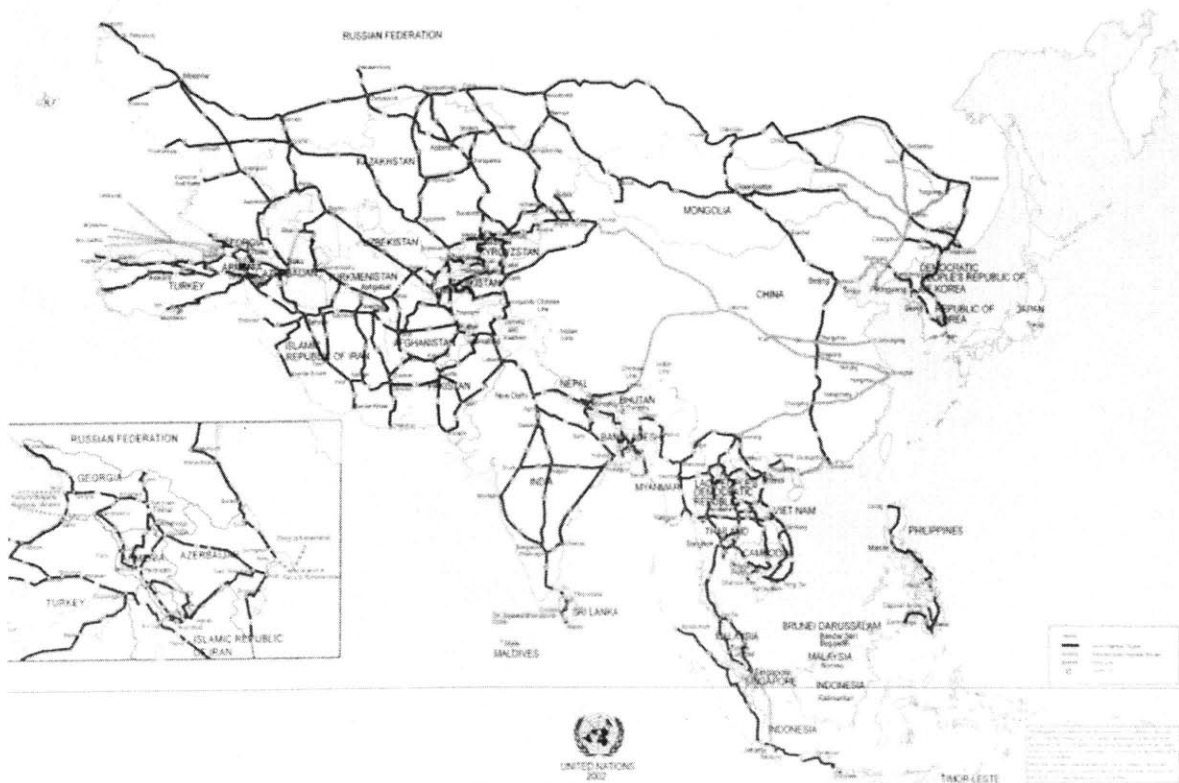


Figure 14 East-to-West artery one [UNESCAP, 2003]

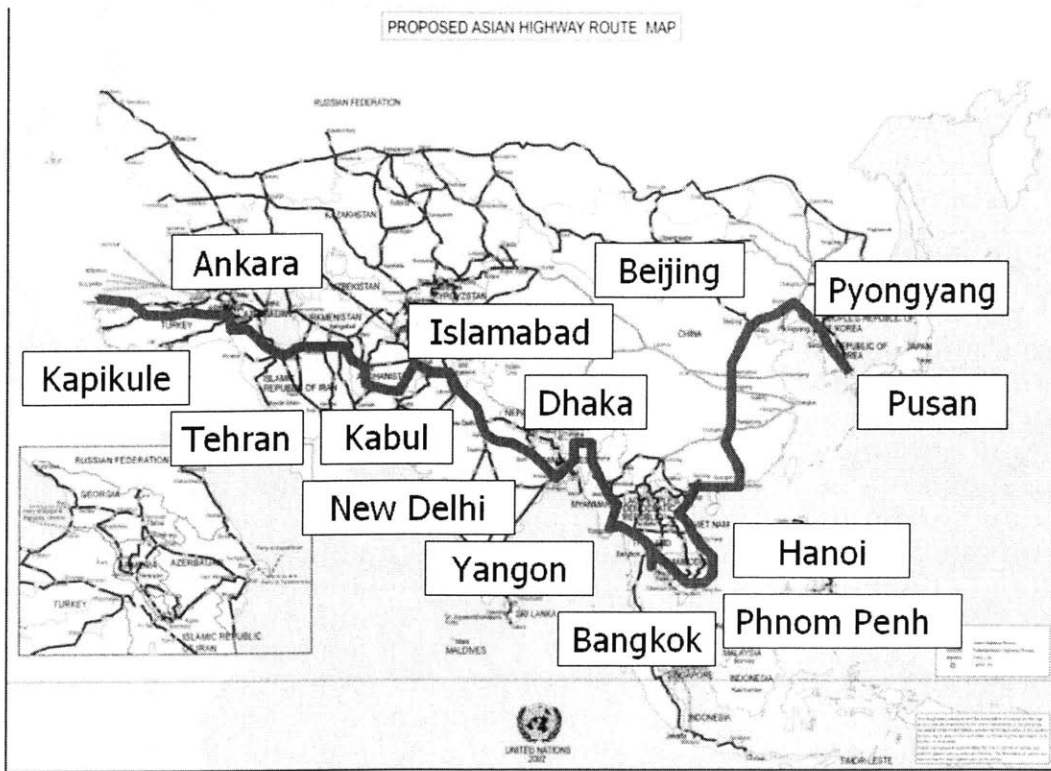


Figure 15 East-to-West artery two [UNESCAP, 2003]

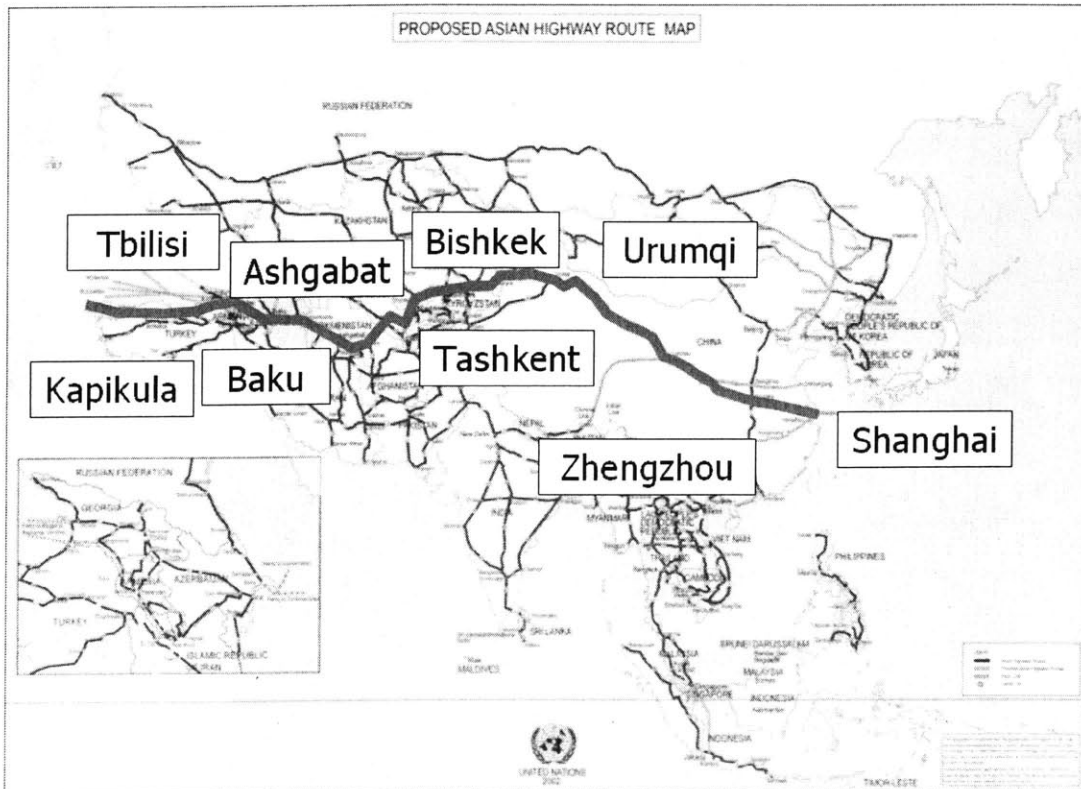


Figure 16 East-to-West artery three [UNESCAP, 2003]

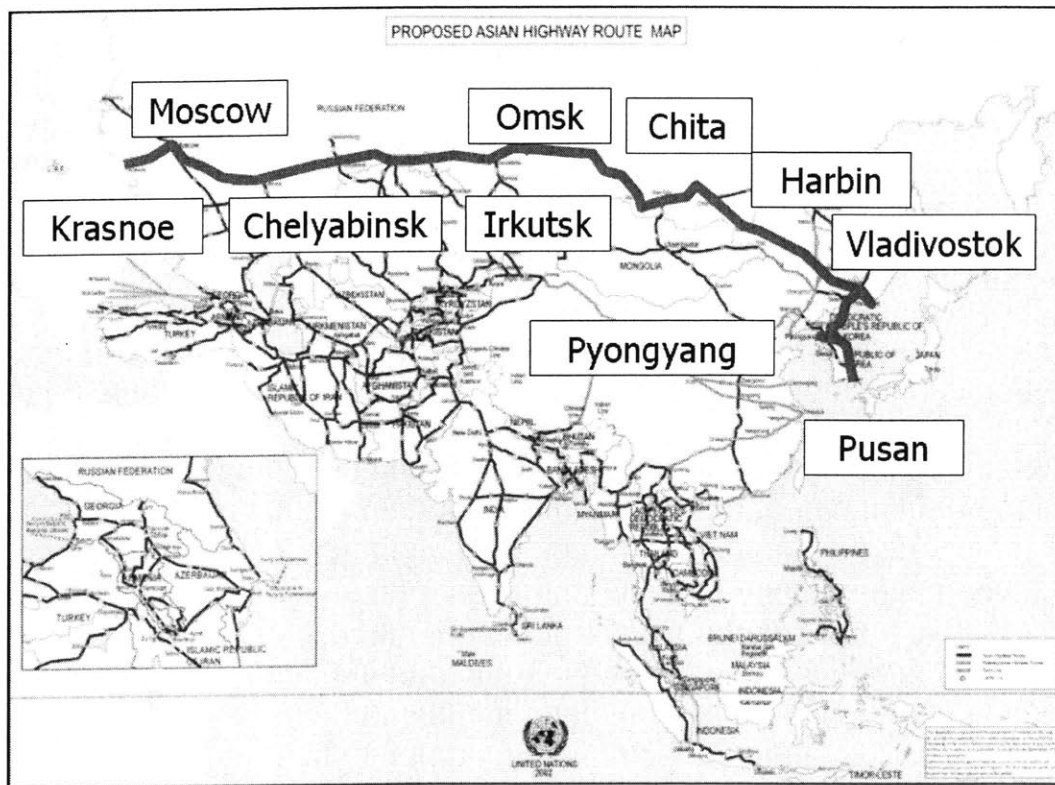


Figure 17 North-to-South artery one [UNESCAP, 2003]

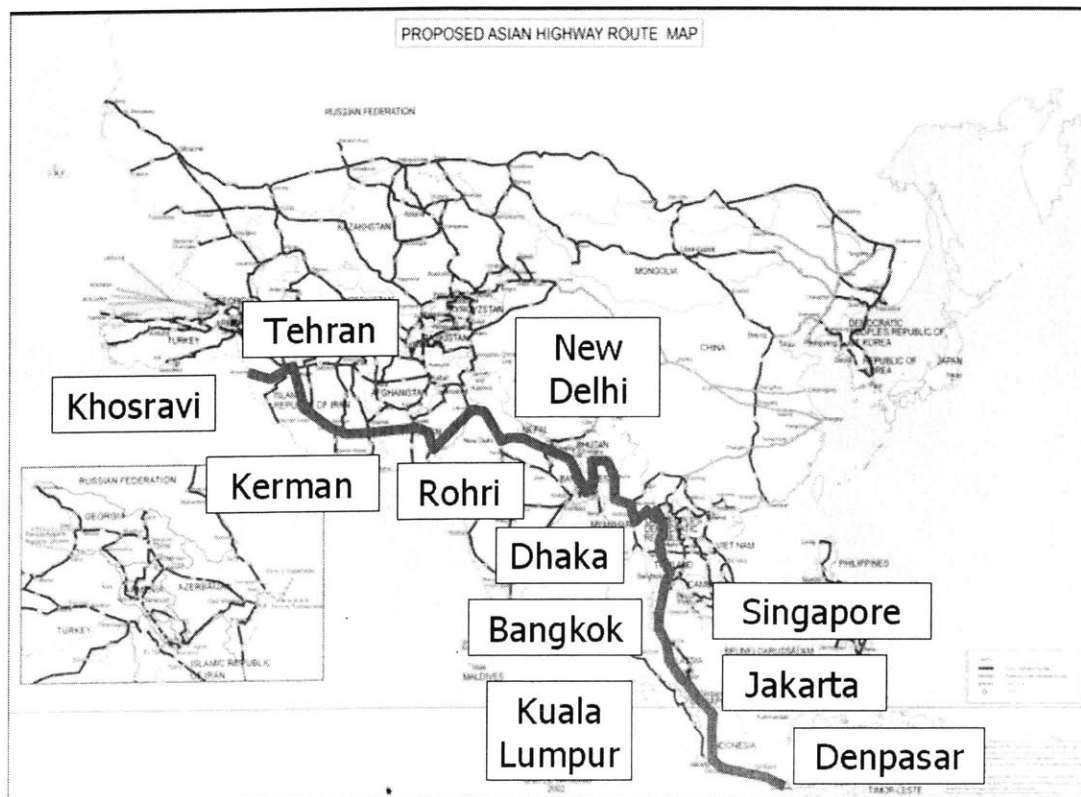


Figure 18 North-to-South artery two [UNESCAP, 2003]

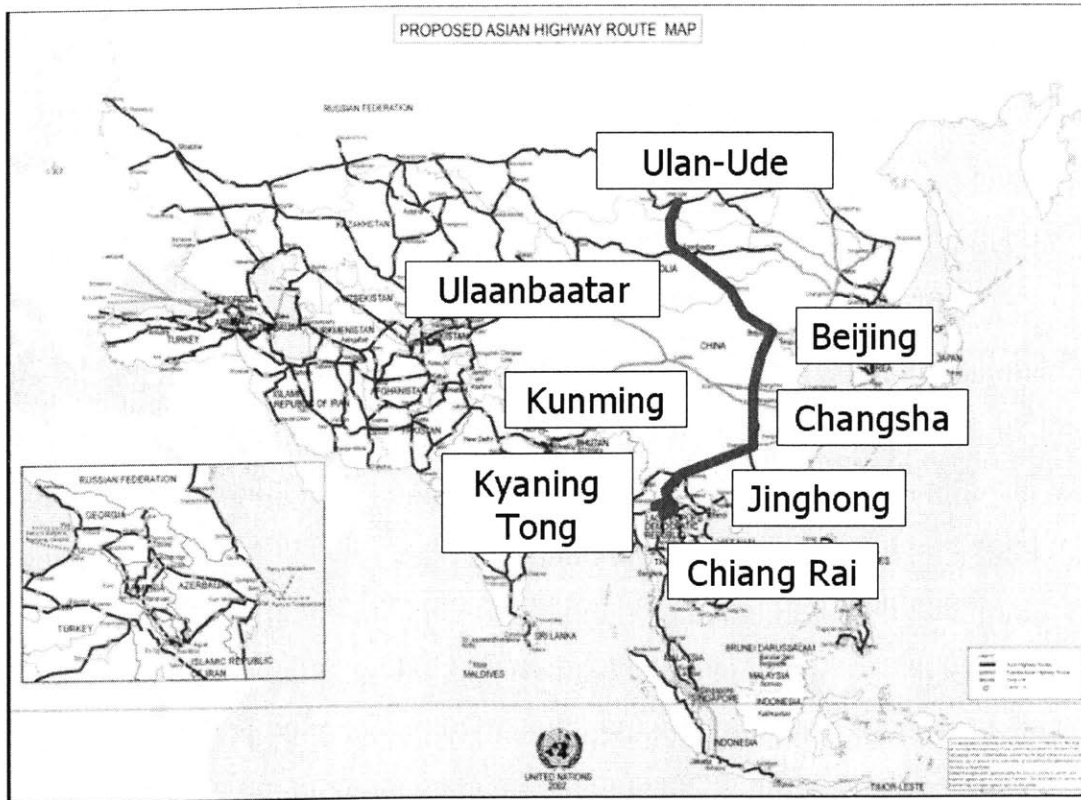


Figure 19 North-to-South artery three [UNESCAP, 2003]

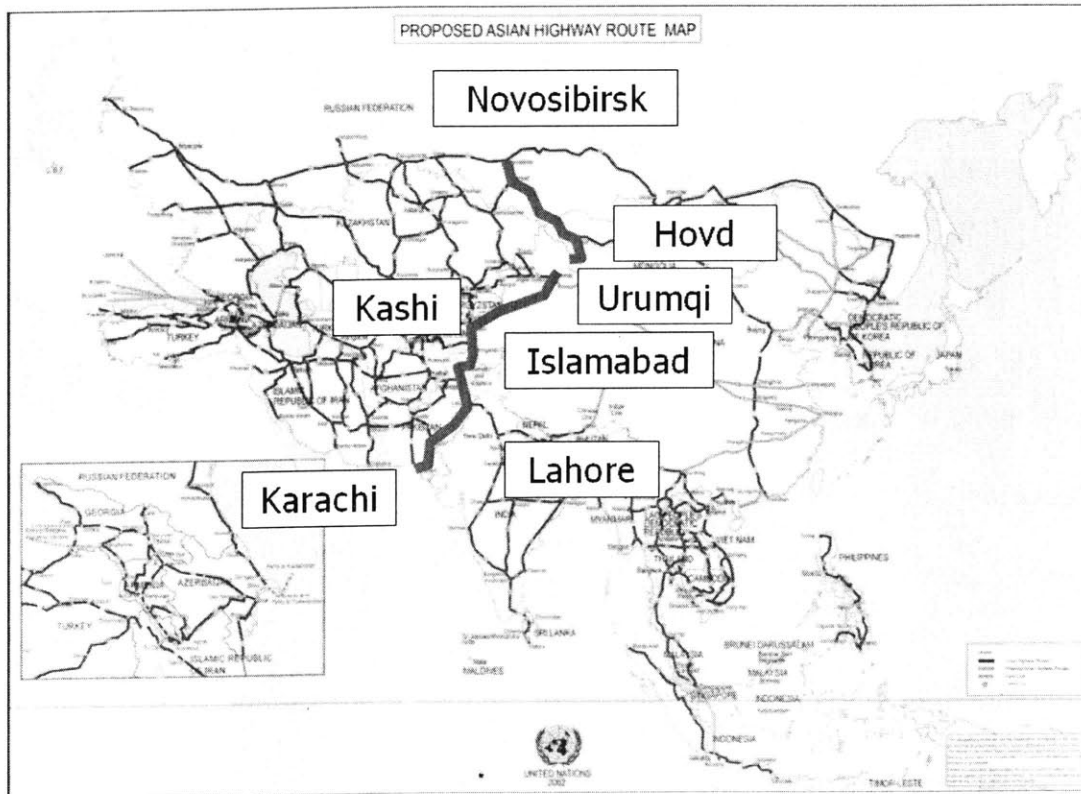


Figure 20 North-to-South artery four [UNESCAP, 2003]

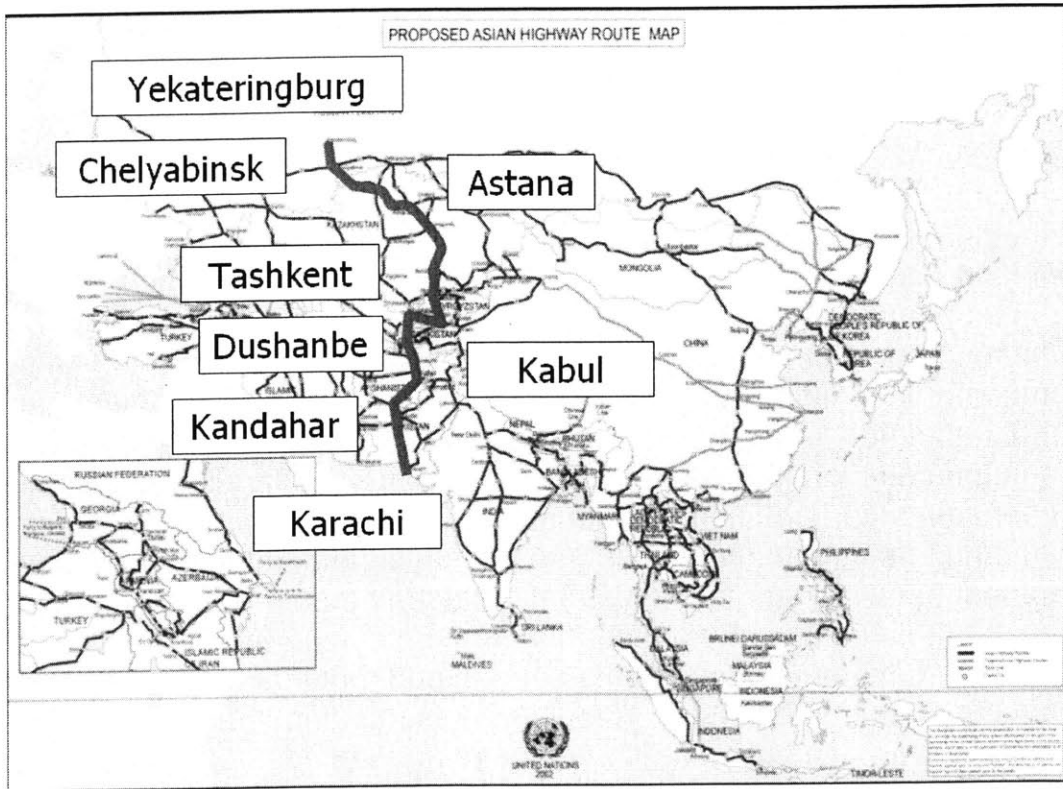
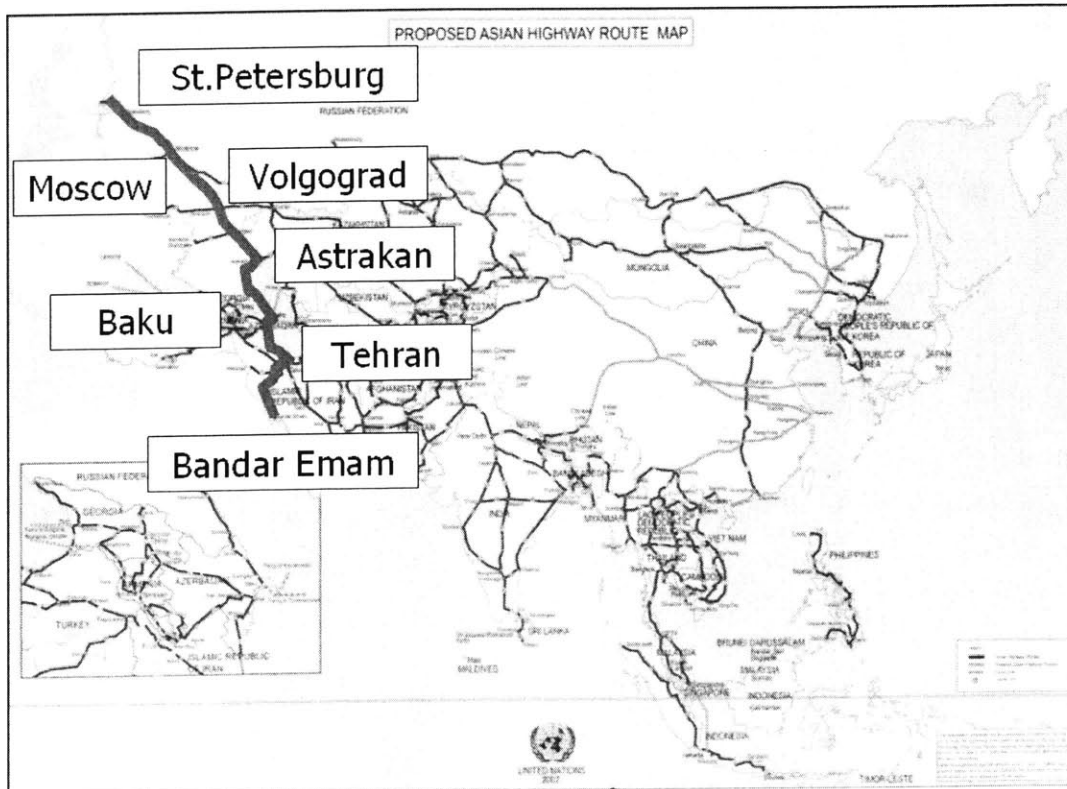


Figure 21 North-to-South artery five [UNESCAP, 2003]



4.2.3 Rail transportation

Rail transportation offers large-volume movements of low-value commodities, but requires a high level of fixed versus variable costs, while fixed costs are incurred whatever the traffic volume. It also requires terminal facilities, in order to support the services of loading and unloading, maintenance etc.

The railway route development in the Asian region increased marginally by 1.5 per cent in 1999. Almost three quarters of the overall route length is not electrified. The number of operating assets such as locomotives, freight wagons and passenger coaches have been reduced in most countries, reflecting the overall stagnation in traffic tasks (-1.5 per cent per year for freight traffic and a marginal increase of 0.3 per cent per year for passenger traffic). According to a report published by the UNESCAP, in 2002, in spite of efforts to improve asset management, the overall route productivity (efficient use of rail routes) has declined by -1.3 per cent per year.

A number of features speak in favor of a greater utilization of rail transport in Asia:
[Declaration, St. Petersburg, 1998]

(i) Twelve landlocked countries are located on the Asian continent with the nearest ports often several thousands of kilometers away; these countries particularly need the railways in order to transport heavy and big loads and play the role of intermediate countries. These countries often lack highways too.

(ii) The distances linking the main origin and destination, both domestically and internationally, are of a scale on which railways find their full economic justification; Asia is the biggest continent on the planet and distances that need to be covered even within one nation are thousands of kilometers.

(iii) The reliance on ports to connect national economies to the world's markets with the need to clear landside port areas quickly to avoid congestion; the containers and bulk load should be redirected when unloading at ports. Railways can lower the congestion levels.

(iv) A number of countries are major exporters of mineral resources in the logistics of which rail transport plays a crucial role; the bulk properties of the minerals, their heavy weight and cheap and time-insensitive character makes a perfect match for transport with trains. Finally,

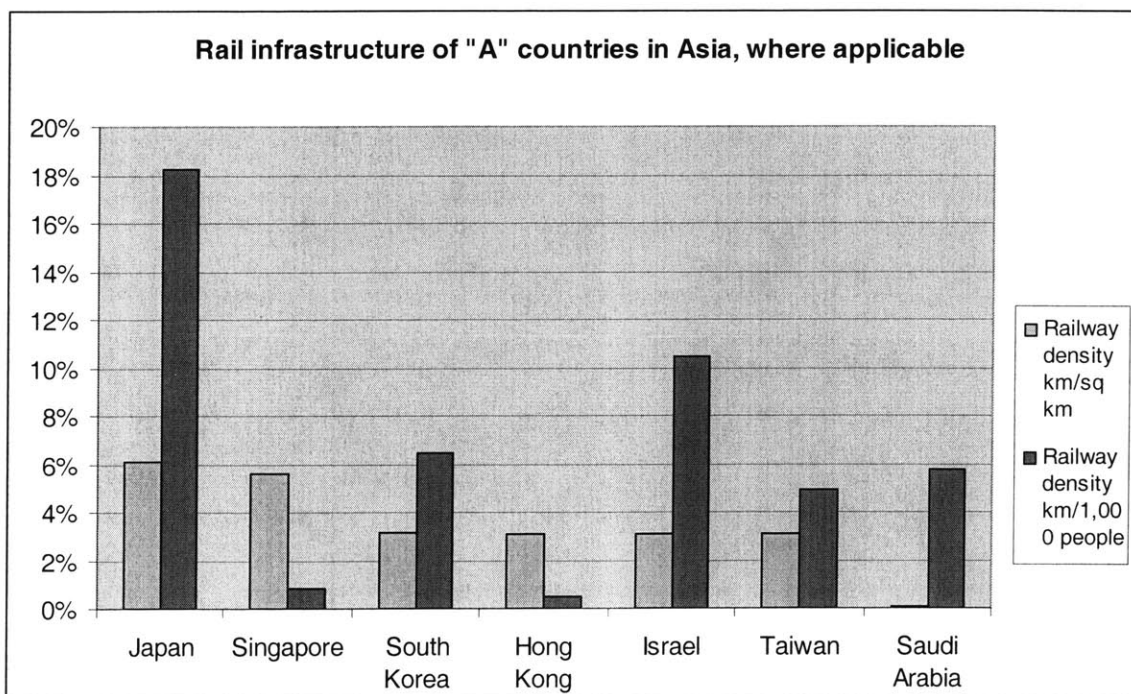
(v) The continuing surge in the volumes of goods being exchanged.

In Table 17 one can see the railways' length in "A" countries in descending order according to the density ratio. The railroad density in these developed countries is advantageous in comparison to the rest of Asia, with the exception of Saudi Arabia. Bahrain, Kuwait, Bhutan, Macau, Qatar, Oman, and the UAE which are half of the "A" countries do not have railways at all. This is not an issue that constraints their transportation infrastructure though. These countries are particularly small, and they manage to utilize alternative modes in order to transport their commodities, as explained at an earlier section. These countries happen also not to be intermediate countries.

Table 17 Asian countries in category "A" railways' length and density ratio in descending order by the density in km/sq km [CIA, The World Fact book, 2004]

Country	Land area (sq km)	Railways, length (km)	Population in million	Railway density km/sq km	Railway density km/1,000 people
Japan	377,835	23,168	126.97	6.13%	18.25%
Singapore	693	39	4.45	5.63%	0.88%
South Korea	98,480	3,125	48.32	3.17%	6.47%
Hong Kong	1,092	34	7.30	3.11%	0.47%
Israel	20,770	640	6.12	3.08%	10.46%
Taiwan	35,980	1,108	22.55	3.08%	4.91%
Saudi Arabia	1,960,582	1,392	24.29	0.07%	5.73%

Figure 22 Rail infrastructure of "A" countries in Asia, where applicable [CIA, The World Fact book, 2004]



For the "B" countries of this study the data are presented in Table 18 below. The Figure that follows (23) shows the density of the railroads in these countries.

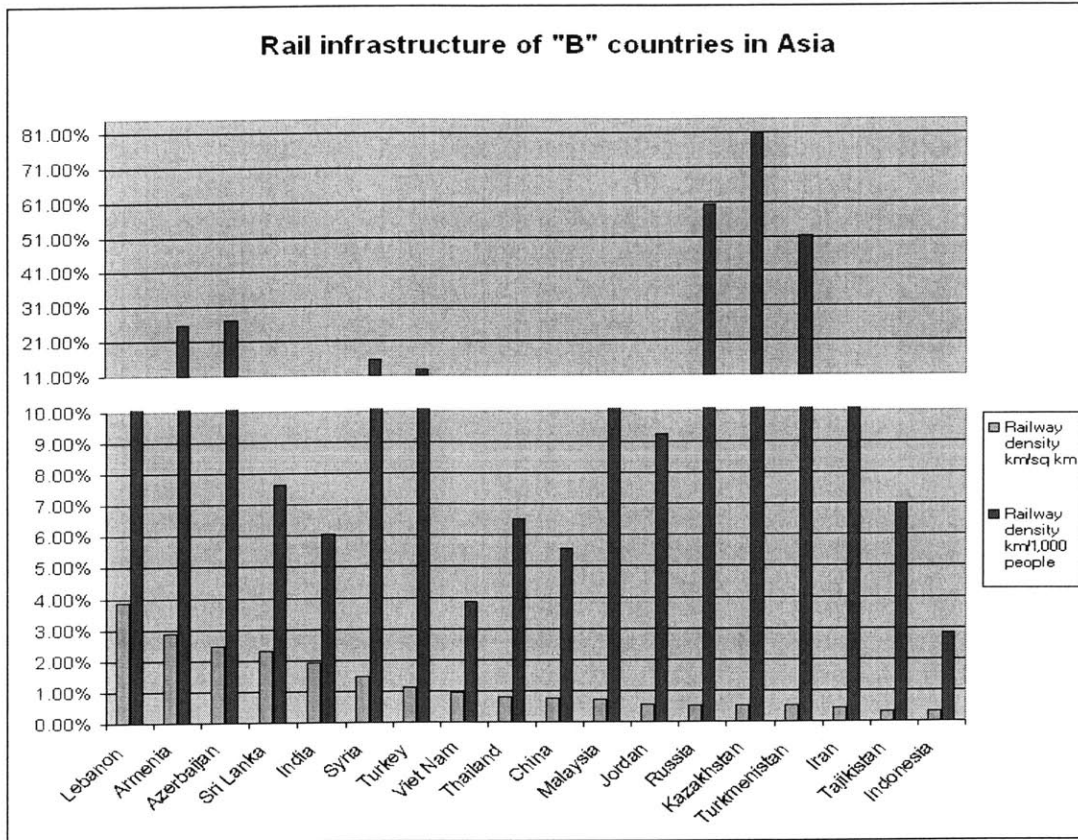
Table 18 Asian countries in category "B" railways' length and density ratio in descending order by the density in km/sq km [CIA, The World Fact book, 2004]

Country	Land area (sq km)	Railways, length (km)	Population in million	Railway density km/sq km	Railway density km/1,000 people
Lebanon	10,400	401	3.73	3.86%	10.76%
Armenia	29,800	852	3.33	2.86%	25.61%
Azerbaijan	86,600	2,122	7.83	2.45%	27.10%
Sri Lanka	65,610	1,508	19.74	2.30%	7.64%
India	3,287,590	63,518	1,049.70	1.93%	6.05%
Syria	185,180	2,743	17.59	1.48%	15.60%
Turkey	780,580	8,607	68.11	1.10%	12.64%
Viet Nam	329,560	3,142	81.10	0.95%	3.87%
Thailand	514,000	4,071	62.35	0.79%	6.53%
China	9,596,960	71,600	1,284.30	0.75%	5.58%
Malaysia	329,750	2,418	22.66	0.73%	10.67%
Jordan	92,300	505	5.46	0.55%	9.25%
Russia	17,075,200	87,157	144.53	0.51%	60.31%
Kazakhstan	2,717,300	13,601	16.76	0.50%	81.13%
Turkmenistan	488,100	2,440	4.78	0.50%	51.09%
Iran	1,648,000	7,201	68.28	0.44%	10.55%
Tajikistan	143,100	482	6.86	0.34%	7.02%
Indonesia	1,919,440	6,458	228.44	0.34%	2.83%

With the exception of Lebanon, and Syria that are small Middle Eastern countries and have a ratio of 1.5% and above, Armenia and Azerbaijan that own their infrastructure from the time when they belonged to the Soviet Union, India and Sri Lanka that utilize their railroads extensively in comparison to the rest of "B" developing countries and Turkey, the rest of the countries seem to have a very undeveloped railway network. Thailand, Malaysia and Indonesia have a ratio of less than 1% and large countries such as China, Russia, the former Soviet Union countries of this category, and Iran have a significantly small network. Russia, China and India have the longest network in absolute

values but not relatively to their size.

Figure 23 Rail infrastructure of "B" countries in Asia, where applicable [CIA, The World Fact book, 2004]



In category "C" Afghanistan, Nepal, Mongolia, the former Soviet Union countries of this group and the Philippines have a severely underdeveloped network. The density of these networks does not allow interconnectivity with other modes of transportation, and is not sufficient enough to reach the border and connect to other existing neighboring railway infrastructure (Trans-Siberian Railway and rest of fragmented Trans-Asian Railways). Below, in Table 19 one can see the length and density ratio for these countries and in Figure 24 the graphical representation of these densities. In this category Laos and Yemen are countries with no railroads at all. As explained previously this does not

automatically affect their trade because they are small and not intermediate countries (unlike Afghanistan, Nepal, Mongolia, and the former Soviet Union "C" countries). Also they can always utilize alternative modes of transportation (both have access to the sea).

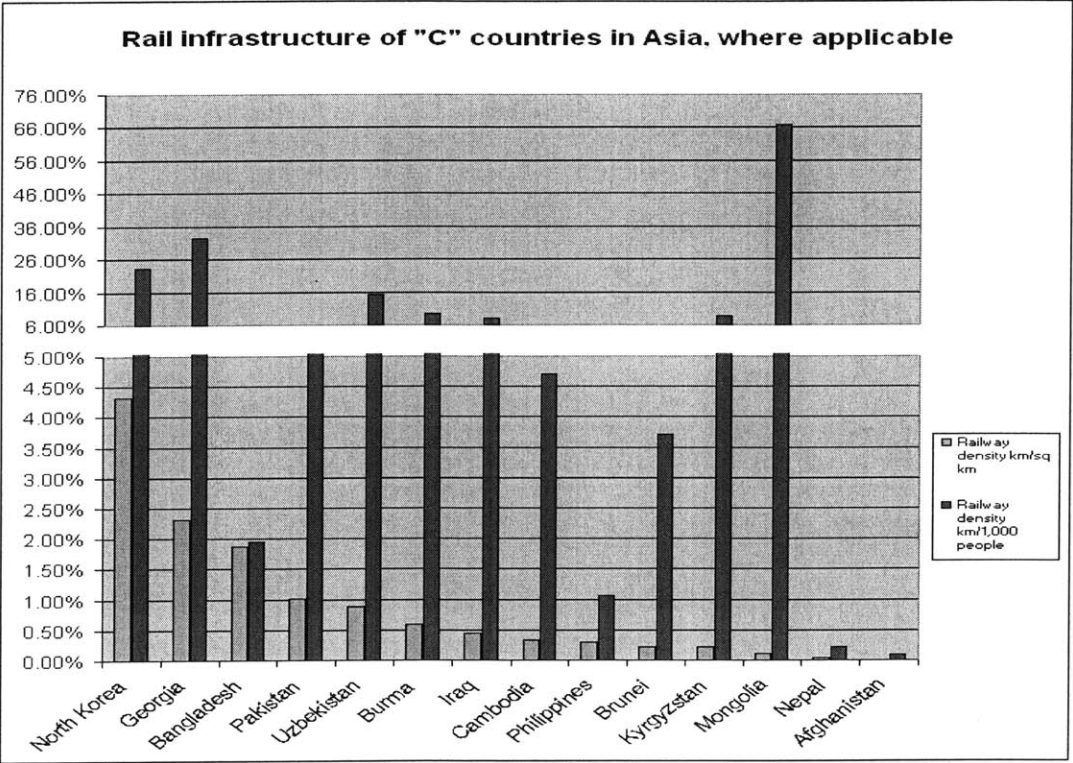
Table 19 Asian countries in category "C" railways' length and density ratio in descending order by the density in km/sq km [CIA, The World Fact book, 2004]

Country	Land area (sq km)	Railways, length (km)	Population in million	Railway density km/sq km	Railway density km/1,000 people
North Korea	120,540	5,214	22.47	4.33%	23.21%
Georgia	69,700	1,612	4.93	2.31%	32.67%
Bangladesh	144,000	2,706	138.45	1.88%	1.95%
Pakistan	803,940	8,163	150.69	1.02%	5.42%
Uzbekistan	447,400	3,950	25.98	0.88%	15.20%
Burma	678,500	3,955	42.24	0.58%	9.36%
Iraq	437,072	1,963	24.68	0.45%	7.95%
Cambodia	181,040	602	12.78	0.33%	4.71%
Philippines	300,000	897	84.53	0.30%	1.06%
Brunei	5,770	13	0.35	0.23%	3.70%
Kyrgyzstan	198,500	420	4.89	0.21%	8.58%
Mongolia	1,565,000	1,815	2.71	0.12%	66.92%
Nepal	140,800	59	26.47	0.04%	0.22%
Afghanistan	647,500	25	28.72	0.00%	0.09%

Even though we have data about the railways' length, their condition is a very critical matter in that case. The speed that can be reached on these corridors is a very important factor, as well as whether there are two lines serving the inbound and outbound of every major destination. Delays in railroads can be very long lasting if the infrastructure is not optimized. Additionally, it is estimated that 1,500 km of railroads in the region deteriorate each year, and that capital repairs have been well below annual requirements for years. Many rails use discarded track, which results in slow-speed traffic and frequent

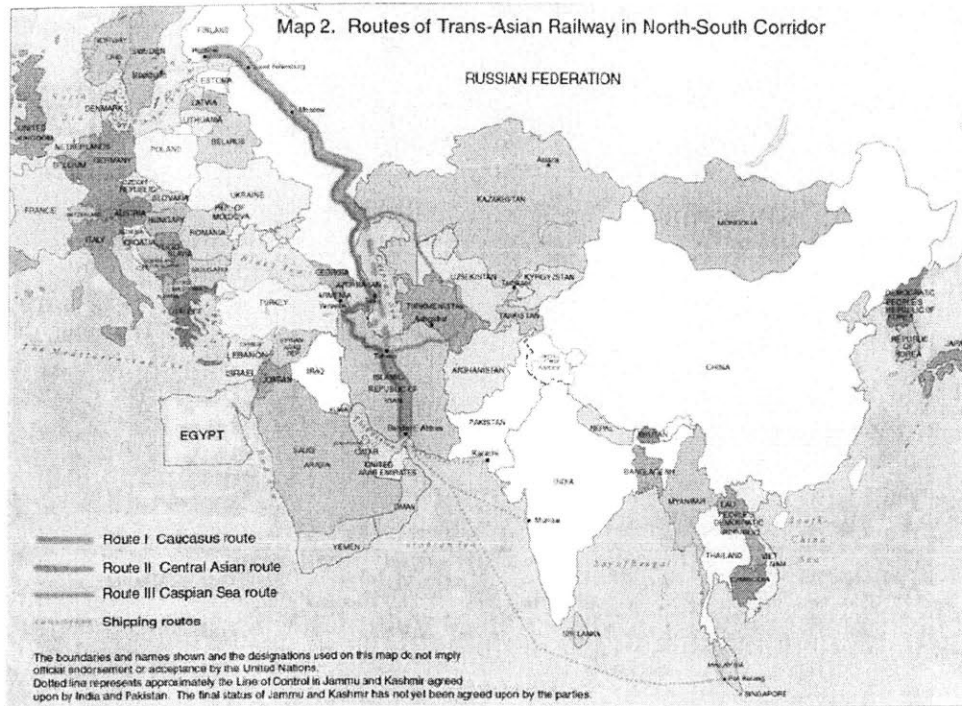
breakdowns. Moreover rolling stock is poorly maintained. Rail networks in the countries of this category reflect outdated priorities. [ADB, 2004]

Figure 24 Rail infrastructure of "C" countries in Asia, where applicable [CIA, The World Fact book, 2004]



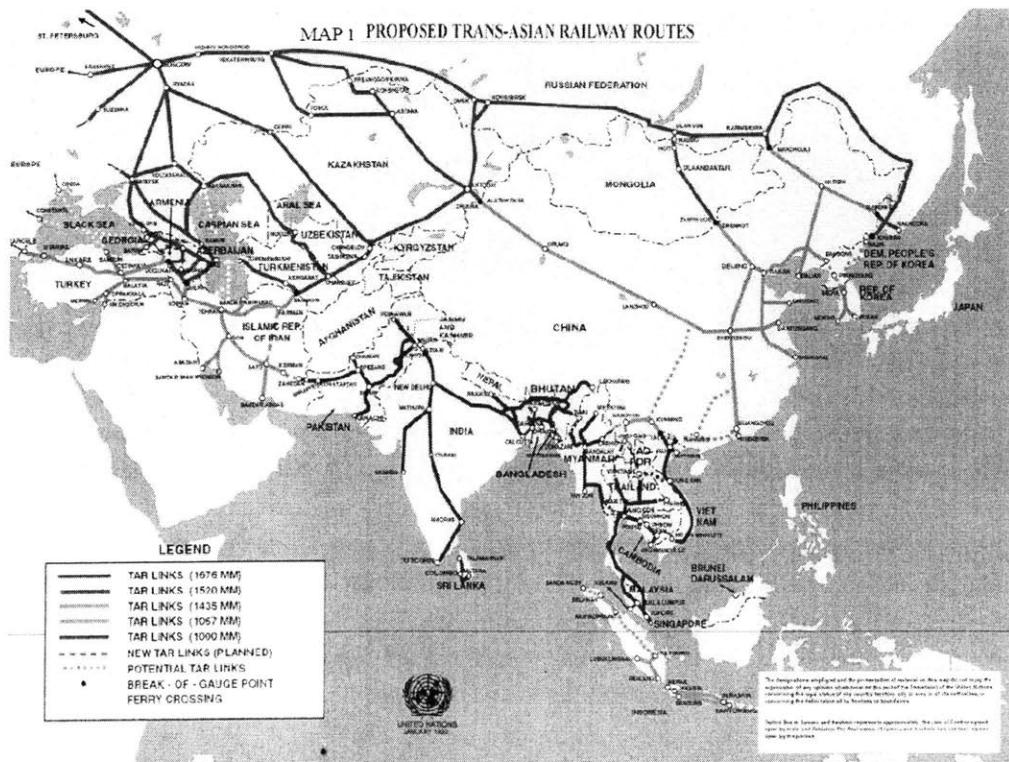
In railways in countries “B” and “C” in Asia it has been very hard to meet maintenance and renovation needs, and infrastructure is deteriorating. Safety problems that need to be addressed increase cost further. [Evren. 1998] In response to the need for better railroad infrastructure and service, the ESCAP, in 1992, initiated the integrated Asian Land Transport Infrastructure Development (ALTID) project, comprising the Trans-Asian Railway (TAR) project as well as facilitation of land transport. [UNESCAP, 2002] In Figure 25 below, one can see the existing routes of the Trans-Asian Railway in North-South Corridor.

Figure 25 Existing Routes of the Trans-Asian Railway in North-South Corridor [UNESCAP, 2002]



In Figure 26 below, one can see the proposed Trans-Asian Railway routes.

Figure 26 Proposed Trans-Asian Railway Routes [UNESCAP, 2002]



According to the Asian Development Bank (ADB), the single rail corridor connecting the Central Asian republics with China is a potential obstruction to trade. All trade must pass through the Druzba-Ala Pass at the Kazakhstan-China border, and the countries in the region have disagreed about transportation access and settlement of accounts. Constructing rail or providing for inter-modal connections between the Uzbek and the Chinese rail systems would reduce the pressure on this potential choke point and provide significant internal benefits to the Kyrgyz Republic.

What these proposed routes resemble of is the UNESCAP proposed highway routes in then Asian region. Once again the goal is an integrated, interconnected transportation (railway this time) system that will facilitate the trade in the region. The corridor is intended to serve the transportation of cargo initiating or ending its trip in South Asia, particularly India and Pakistan, and South-East Asia. A study of UNESCAP, in 2002 adds that connections to countries in South Asia could be by rail or shipping, while destinations in South-East Asian countries would be mostly reached by shipping services. The railways could serve the latter countries too with possible use of rail for the ultimate leg of the journey from the main ports, such as Singapore or Port Kelang (Malaysia) to destinations in Malaysia and Thailand.

In the long-term future, other countries in South-East Asia (Cambodia, Laos, Burma, and Vietnam) and Yunan province of China are included in the plans so as to be served, after their rail systems have been interconnected.

4.2.4 Sea transportation

Barges, tankers, containerships, Ro-Ro vessels, bulk and neo-bulk and breakbulk carriers are the elements of the sea transportation. In that particular mode the characteristics are low cost service, high capacity, slow speed, service disruption because of various weather phenomena, and constraints put by the vessels' size and accessibility. It is a capital intensive transportation mode that requires ports to operate, and pickup and delivery terminals, for inland, coastal or intercoastal transportation.

Krumm, in 2003 refers to the port container throughput increase for Asia and the Pacific. The data show an average of 11 per cent per year throughout the 1990s, reaching 95 million TEU in 1999, which is more than half the world's total port container throughput. On the other hand, port container throughput growth in South and South-West Asia was below the world average.

A report published by UNESCAP, in 2001 presents that significant economies of scale have enabled the increase of the capacity of a newly built mainline container ship from 4,000 TEU in 1991, to 6,800 TEU in early 2000. The same report states that most of the bigger ships operate on Asian routes. Industry experts indicate that newly built vessels may reach 12,000 TEU in the next 5 to 10 years. Moreover, as the size of mainline vessels is increasing, so is the size of feeder vessels, which have generally nearly doubled their capacity to 2,000 TEU.

Another report published by the United Nations, in 2001 claims that the containerized cargoes are growing at a rate of 3.3% annually. The same report presents a scenario that there are likely to be approximately 330 vessels with capacities of 6,000 TEU and above that would be deployed on routes to and from Asia by the year 2006. This number is expected to grow to over 470 by 2011. Approximately 130 of these would be of 10,000 TEU or above.

Despite the very large cargo volumes that will continue to be available on the trans-Pacific route (mostly between Asia and the United States of America and Canada), it appears unlikely that many vessels of 8,000 TEU and up will see service in this trade over the next decade. The same report suggests that the longer distances on the Far East-Europe and North America via the Suez route make them more suitable for very large vessel operations. "On these routes also, the inclusion of calls at Singapore (or Tanjung Pelepas) and a Mediterranean hub port would allow the vessels to access a number of major markets without significant deviation. It is therefore likely that most vessels of 8,000 TEU and above will be deployed on these routes." [United Nations, 2001]

It is expected that the hub ports that focus on intercontinental routes will need to be able to host vessels of this scale in order to be competitive. Under this scenario, express services with minimal port calls (efficient logistics) need to become a major characteristic of the Asian trades. This encourages the use of even larger vessels on highly streamlined routes between key hub ports and bigger facilities. Bigger facilities are also needed because of the backlogs that occur at the ports of the West World, because of security

checks for terrorism and diseases (SARS, mad cow disease, avian influenza) that keep the containers on the ships or in the ports for scanning.

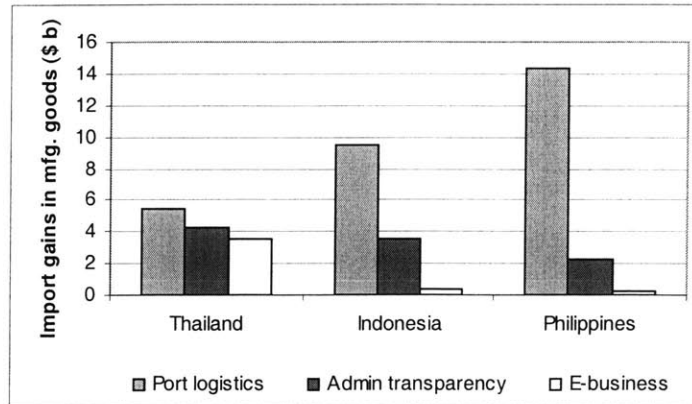
The ports in Asia need to face this challenge and build bigger and more technologically advanced ports in order to satisfy the demand. Krumm, 2003 presents the importance of port logistics and their effect on trade in his results. Port logistics seem to have a higher impact on the effectiveness of trade in comparison with other variables examined, such as the standard harmonization, the administrative transparency, and the implementation of electronic business. In the Table below, one can see the stimulating effect on trade coming from the improvement of port logistics.

Table 20 Improving Port Logistics Has the Highest Stimulating Effect on Trade [Krumm, 2003]

Improving port logistics have highest stimulating effect on trade		
Variable	Elasticity	
	Manufactured goods	Agriculture and raw materials
Port logistics	5.2	3.7
Std. Harmonization	0.7	0.5
Adm. Transparency	0.5	-0.3
E-business	0.3	0.6

The importance of port logistics is also shown in Figure 27. The import gains in manufacturing goods for three example countries, Thailand, Indonesia, and Philippines are much higher when the investment occurs in port logistics.

Figure 27 Import gains in Manufacturing Goods (\$ billion) [Krumm, 2003]



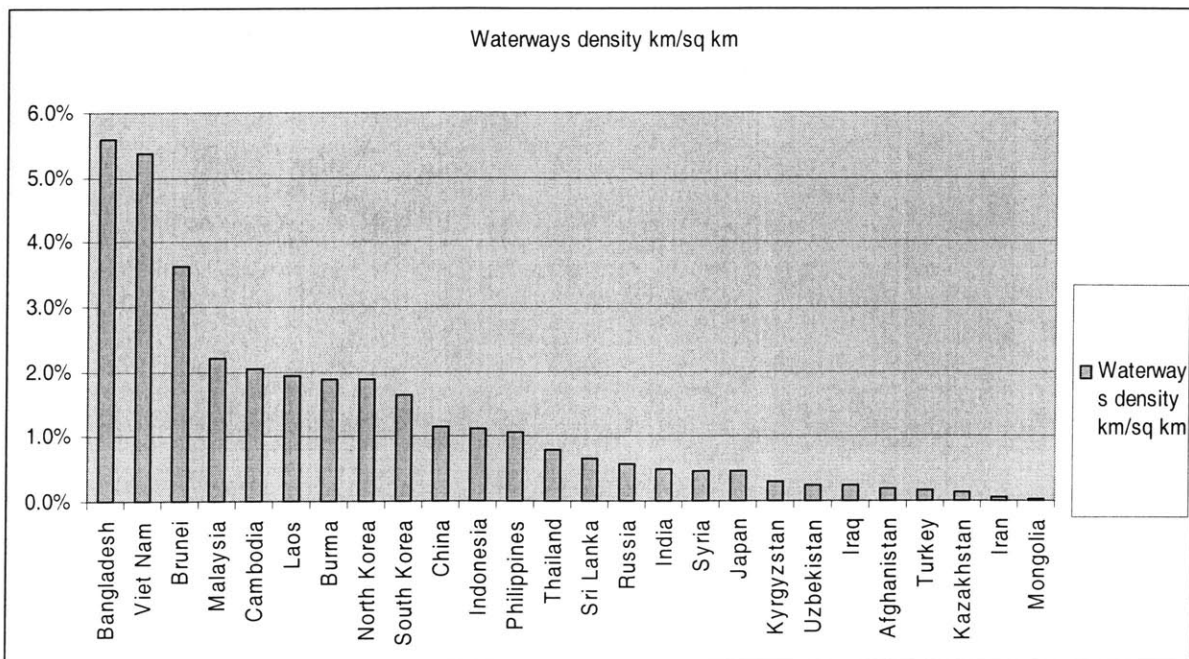
The “A” countries of the region (mostly Japan, Singapore, Hong Kong, Macau, South Korea, Israel, Taiwan, Kuwait, the United Arab Emirates, and Saudi Arabia, and less Bahrain, Oman, Qatar, and Brunei) have great ports that can handle the demand for services. Most of these countries’ practices and operations have been the example for other developed countries around the world. Either they are great trading countries or major oil exporters, they utilize the sea transportation efficiently.

The “B” countries, especially China, Malaysia, the Philippines, Indonesia, Thailand, Russia, Vietnam, India, and Turkey, have several ports use them for a high share of their transportation needs. These facilities, with few exception e.g. the port of Shanghai’s, are not highly developed and their capacity is not adequate to satisfy the demand. The wait times in these ports can exceed the 30 days for loading and unloading. Other facilities in Kazakhstan, Azerbaijan, Syria, Iran, Sri Lanka, Jordan and Lebanon are even worse. For Armenia this is not applicable because it is a land-locked country; Turkmenistan has only one small port.

Finally, the “C” countries Afghanistan, Georgia, Pakistan, Kyrgyzstan, Iraq, Yemen, Uzbekistan, North Korea, Bangladesh, Burma, and Cambodia are missing basic infrastructure. In most of the cases, their facilities cannot handle simple demand and the operations are very time consuming. This is not applicable to Bhutan, Nepal, Laos, Mongolia, and Tajikistan that are land-locked countries.

In Figure 28 below, one can see the Asian countries that have inland waterways integrated in their transportation system. Very few of the “A” countries have inland waterways (South Korea, and Japan), even though they are placed by the sea. There were no data for Armenia, Taiwan, and Turkmenistan, and no waterways for Yemen, the UAE, Tajikistan, Singapore, Saudi Arabia, Qatar, Pakistan, Oman, Nepal, Macau, Lebanon, Kuwait, Jordan, Israel, Azerbaijan, Bahrain, Georgia, Hong Kong, and Bhutan.

Figure 28 Inland waterways' density km/sq km [CIA, The World Fact book, 2004]



Many of the “B” and “C” countries utilize their inland waterways, which sometimes reach a density of 5.5% in km/sq km (Bangladesh). Despite the cost-effectiveness of the utilization of these transportation paths, their relative fuel efficiency and importance for mobility, welfare and development of remote regions in the “B” and “C” countries of the region, inland waterways have suffered from a lack of adequate investment for many years.

4.2.5 Air transportation

According to a report published by Boeing in 2003, the air cargo traffic between Europe and Asia accounts for 17.1% of the world's market, in terms of tonne-kilometers and 8.8% in terms of tonnage. The numbers for intra-Asia air cargo are 6.3% and 12.7%, for the Middle East 5.3% and 5.1%, and for Southwest Asia 4.3% and 3.9% respectively. In the following Figures (29 and 30) one can see the air cargo growth between Europe and Asia, as well as the intra-Asia in the past years.

Figure 29 Europe-Asia Air Cargo Growth [Boeing, 2003]

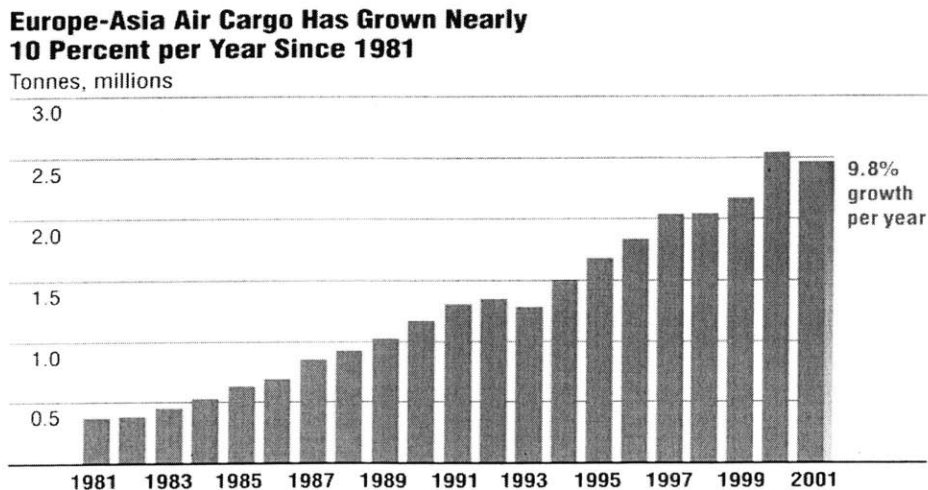
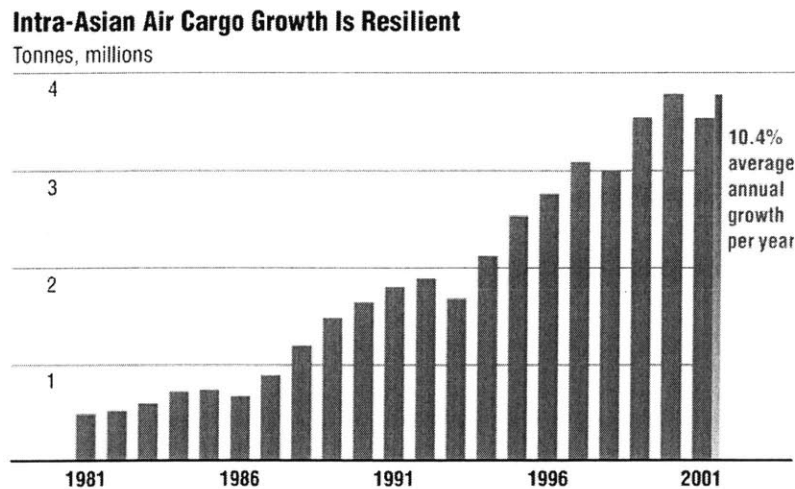


Figure 30 Intra-Asia Air Cargo Growth [Boeing, 2003]



Most nations in Asia are separated by large masses of water, and high-speed surface transportation is frequently nonexistent. Thus, air cargo plays an important role in the intra-Asian and Asian-Europe economic development. Typical of items moving by air within Asia are time sensitive commodities, such as computers, telecommunication equipment, semi manufactured goods, and higher-value perishables.

According to the same report, the Europe-to-Asia air trade is expected to quadruple by 2021 and reach 6 million tones, the Asia-to-Europe air trade is going to grow six times and reach 8 million tones, as well as the intra-Asia air trade that will reach the 25 million tones. Finally, the domestic air trade in China will grow five times and reach 11million tones by the same year. Air cargo growth will depend to a large extent on continued improvement and expansion of airport infrastructure. Construction has been implemented on several new airports or airport improvement projects for much of the past decade, particularly in China, but also Korea, Malaysia, and even Japan.

In the following Table one can see the “A” countries of the region in descending order according to the number of airports per sq km. Figure 31 presents graphically the density of paved airports for these countries.

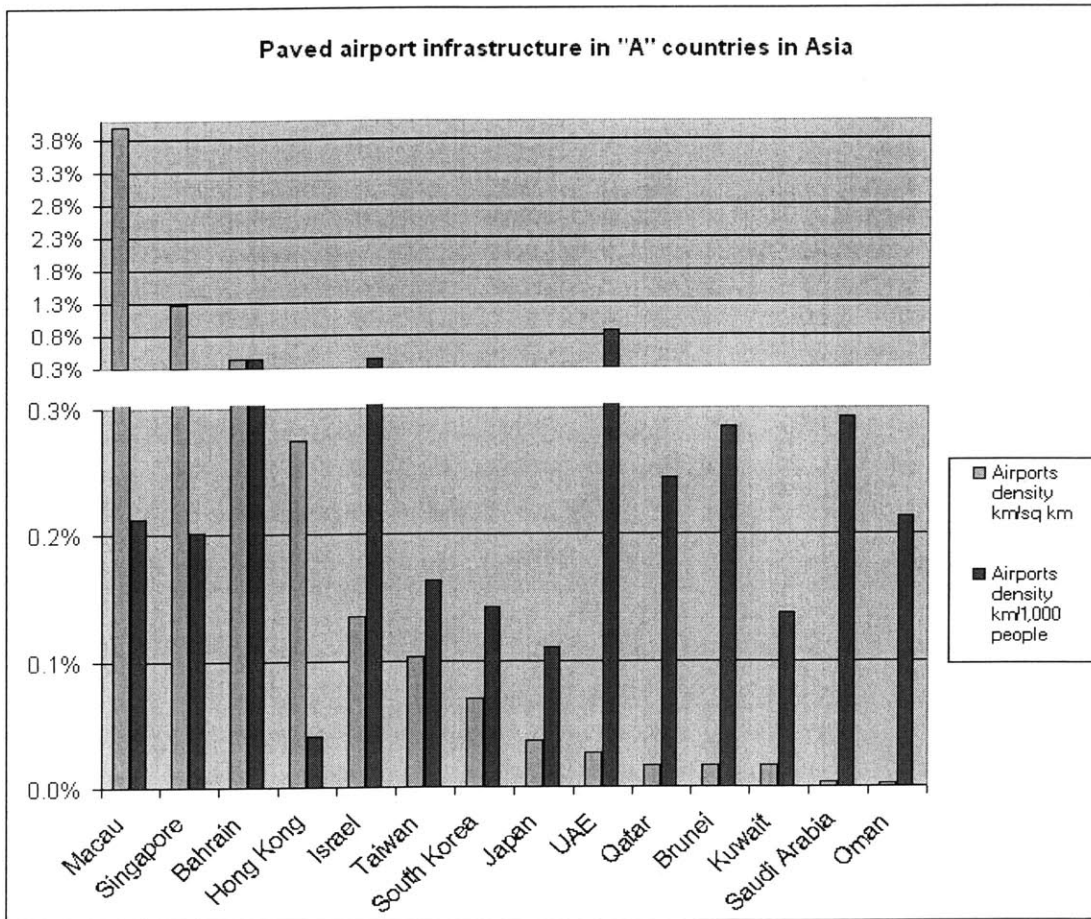
Table 21 “A” Asian countries’ airports and paved runways in descending order according to their density in number/sq km [CIA, The World Fact book, 2004]

Country	Land area (sq km)	Airports [2001]	Paved Runways	Population in million	Airports density number/sq km	Airports density number /1,000 people
Macau	25	1	1	0.47	4.000%	0.21%
Singapore	693	9	9	4.45	1.299%	0.20%
Bahrain	665	4	3	0.67	0.451%	0.45%
Hong Kong	1,092	3	3	7.30	0.275%	0.04%
Israel	20,770	52	28	6.12	0.135%	0.46%
Taiwan	35,980	39	37	22.55	0.103%	0.16%
South Korea	98,480	102	69	48.32	0.070%	0.14%
Japan	377,835	172	141	126.97	0.037%	0.11%
UAE	82,880	41	22	2.48	0.027%	0.89%
Qatar	11,437	4	2	0.82	0.017%	0.24%
Brunei	5,770	2	1	0.35	0.017%	0.28%
Kuwait	17,820	6	3	2.18	0.017%	0.14%
Saudi Arabia	1,960,582	209	71	24.29	0.004%	0.29%
Oman	212,460	139	6	2.81	0.003%	0.21%

Three mega-airport developments have been finished recently: the new Kuala Lumpur International Airport, the new Hong Kong International Airport and Incheon International Airport near Seoul. Other major new airport completions were Macao, China; Shanghai (Pudong); and Cochin, India. New runways or terminal facilities were made, for example, in Bangkok, Beijing, Hanoi, Manila, Singapore, and Tokyo. In the Figure below one can see that the small in size but big trading countries of the region (not so much the small Middle Eastern countries) have a high density, in comparison to the “B” and “C” countries

that follow in Tables 22 and 23 and Figure 32 and 33. Japan has the highest number of paved airports in this category.

Figure 31 Paved airport infrastructure in "A" countries in Asia [CIA, The World Fact book, 2004]



Further investment requirements for airport and air navigation services are needed in countries of the category “A” because these are mostly the countries that will absorb the increase in demand that was mentioned above.

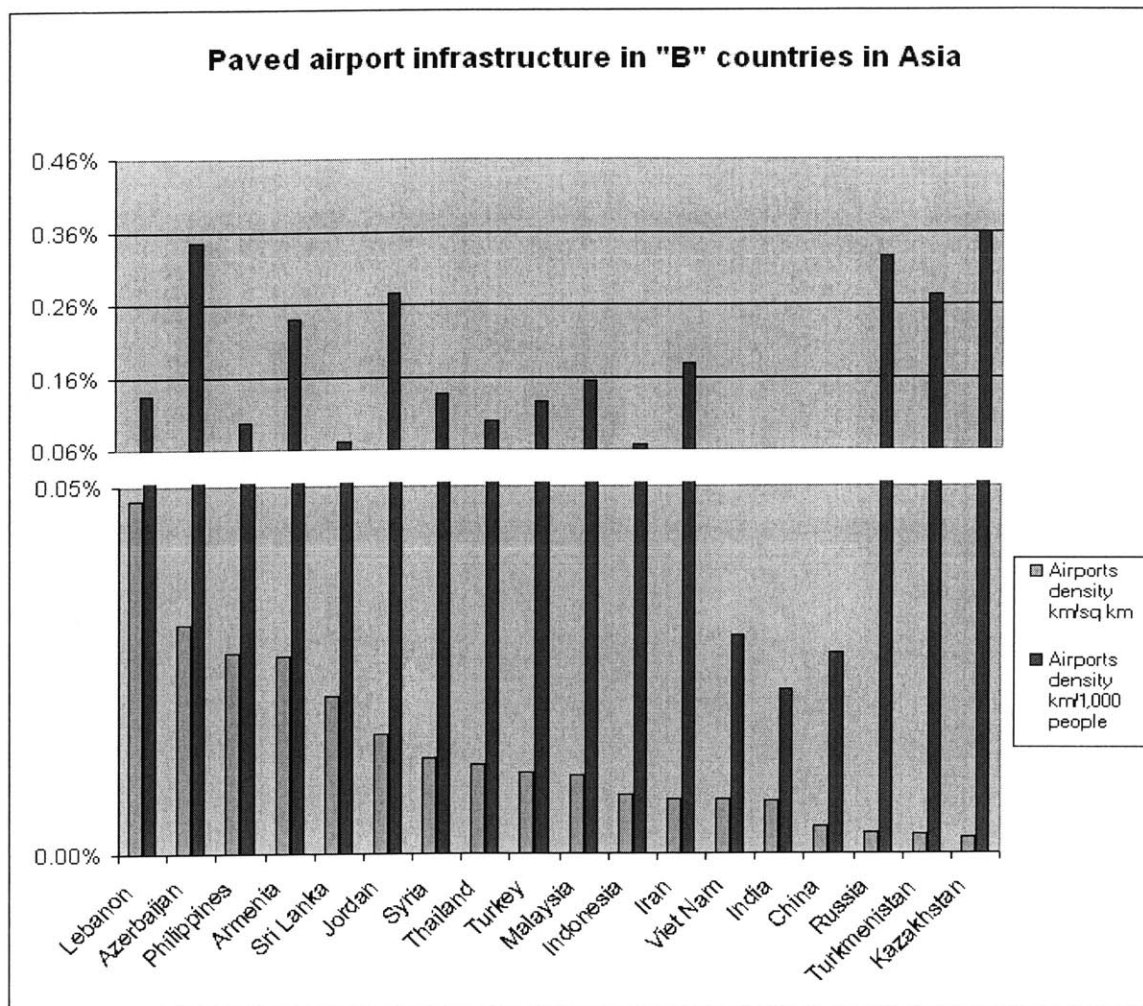
Table 22 “B” Asian countries’ airports and paved runways in descending order according to their density in number/sq km [CIA, The World Fact book, 2004]

Country	Land area (sq km)	Airports [2001]	Paved Runways	Population in million	Airports density number /sq km	Airports density number /1,000 people
Lebanon	10,400	8	5	3.73	0.048%	0.13%
Azerbaijan	86,600	71	27	7.83	0.031%	0.34%
Philippines	300,000	257	82	84.53	0.027%	0.10%
Armenia	29,800	15	8	3.33	0.027%	0.24%
Sri Lanka	65,610	15	14	19.74	0.021%	0.07%
Jordan	92,300	17	15	5.46	0.016%	0.27%
Syria	185,180	92	24	17.59	0.013%	0.14%
Thailand	514,000	111	62	62.35	0.012%	0.10%
Turkey	780,580	120	86	68.11	0.011%	0.13%
Malaysia	329,750	114	35	22.66	0.011%	0.15%
Indonesia	1,919,440	631	153	228.44	0.008%	0.07%
Iran	1,648,000	309	122	68.28	0.007%	0.18%
Viet Nam	329,560	47	24	81.10	0.007%	0.03%
India	3,287,590	334	235	1,049.70	0.007%	0.02%
China	9,596,960	500	351	1,284.30	0.004%	0.03%
Russia	17,075,200	2,743	471	144.53	0.003%	0.33%
Turkmenistan	488,100	76	13	4.78	0.003%	0.27%
Kazakhstan	2,717,300	488	60	16.76	0.002%	0.36%

In category “B”, Russia, China, India, and Indonesia have the highest number of airports in absolute numbers. These are also the largest countries of this category. The density in that category is significantly lower than in category “A” and averages below 0.02.

Malaysia, the Philippines, and Thailand have some good infrastructure in place. Vietnam, and Turkey’s infrastructure is not very technologically advanced. Their airports cannot be utilized easily as hubs and especially in the case of Kazakhstan, Armenia, Turkmenistan, Azerbaijan, Syria, Iran, Sri Lanka, Jordan and Lebanon the situation is even worse.

Figure 32 Paved airport infrastructure in "B" countries in Asia [CIA, The World Fact book, 2004]



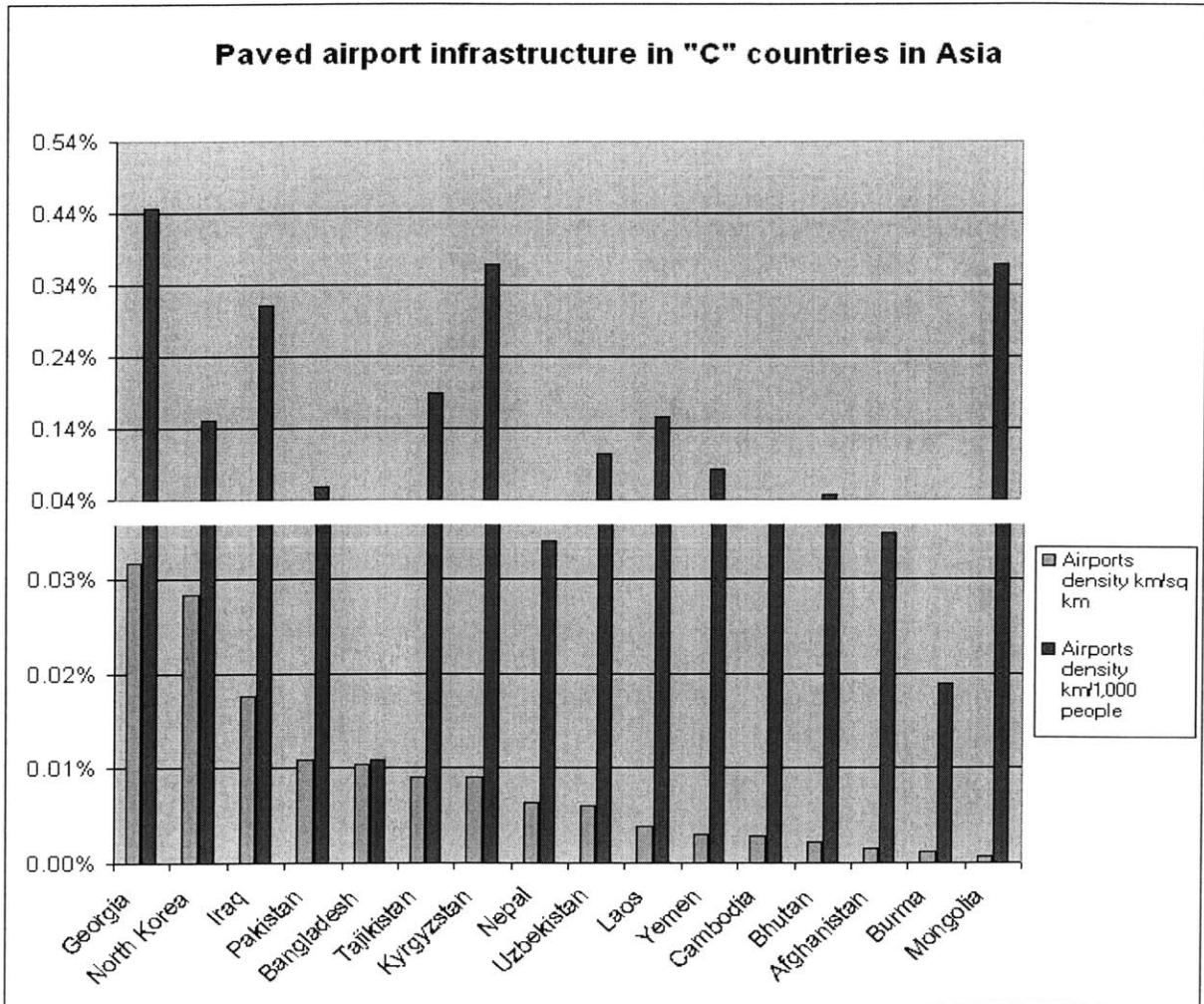
Finally, the “C” countries Afghanistan, Georgia, Pakistan, Kyrgyzstan, Iraq, Yemen, Uzbekistan, North Korea, Bangladesh, Burma, Cambodia, Bhutan, Nepal, Laos, Mongolia, and Tajikistan are missing basic infrastructure. In most of the cases, their facilities are nonexistent and cannot handle any demand for trade.

Table 23 “C” Asian countries’ airports and paved runways in descending order according to their density in number/sq km [CIA, The World Fact book, 2004]

Country	Land area (sq km)	Airports [2001]	Paved Runways	Population in million	Airports density number/sq km	Airports density number /1,000 people
Georgia	69,700	40	22	4.93	0.032%	0.45%
North Korea	120,540	72	34	22.47	0.028%	0.15%
Iraq	437,072	150	77	24.68	0.018%	0.31%
Pakistan	803,940	124	87	150.69	0.011%	0.06%
Bangladesh	144,000	18	15	138.45	0.010%	0.01%
Tajikistan	143,100	66	13	6.86	0.009%	0.19%
Kyrgyzstan	198,500	68	18	4.89	0.009%	0.37%
Nepal	140,800	45	9	26.47	0.006%	0.03%
Uzbekistan	447,400	273	27	25.98	0.006%	0.10%
Laos	236,800	51	9	5.78	0.004%	0.16%
Yemen	527,970	44	16	19.35	0.003%	0.08%
Cambodia	181,040	21	5	12.78	0.003%	0.04%
Bhutan	47,000	2	1	2.14	0.002%	0.05%
Afghanistan	647,500	47	10	28.72	0.002%	0.03%
Burma	678,500	80	8	42.24	0.001%	0.02%
Mongolia	1,565,000	50	10	2.71	0.001%	0.37%

In these countries the paved airport infrastructure ratio averages well below 0.005%. The exception in the “B” and “C” countries may seem to be the former Soviet Union countries. This is not a right measure though, because the airports that these countries have are not good for trade but mainly for military bases that the former regime used to force.

Figure 33 Paved airport infrastructure in "C" countries in Asia [CIA, The World Fact book, 2004]



4.2.6 Logistical Infrastructure (Warehousing) and Multimodalism

In order for all the countries in the region that need to respond to the congestion in their Megacities, warehousing is a key issue. Warehousing is a strategic tool for the efficient function of the supply chain. [Tompkins et. al., 1998] In the past few years the warehouse is undergoing significant challenges such as:

(i) A significantly larger number of stock-keeping units. Companies tend to either keep a warehouse (or multiple in many locations) in their ownership, if this is economically efficient or outsource their warehousing to third party logistics and warehousing companies. In both cases a modern warehouse needs to store, and maintain hundreds or thousands of different products or parts.

(ii) Increased customer service requirements. Companies need to cover the demand with the minimum products in stock. At the same time they need to keep a safety stock and a high customer service level and satisfaction, no lost sales and minimum backorder costs.

(iii) Demand for reduced inventory. Companies want to maintain a low stock of products and parts. They also need to maintain their cash flows in high levels and do not prefer to keep a high number of products in stock because they cost money and their value depreciates continuously.

(iv) Demand for increased warehouse operating efficiency and space utilization. The urban areas often lack of space and the space that is available for renting or owning is very expensive. The strategic positioning of a warehouse is very critical and relocation is not always allowed. The operating efficiency should thus be maximized.

(v) Demand for increased product customization. The example of many successful firms such as Dell or leading car manufacturers proves that product customization is a

welcome technique from the customers. The lead time and the space where this customization needs to take place are some of the constraints that have to be taken into consideration.

(vi) The need for increased integration of the warehouse within the total logistics system. The warehouse is the “heart” of the operations. The sales department, the production department, even the marketing department of a company needs to coordinate with the warehouse. The transportation of the raw materials, the vertical or horizontal integration of the production line, and the transport of the final product are all functions that require the warehouse to be ready to support.

(vii) The availability of reliable, responsive, efficient, and effective third party warehouse providers and the questions as to when to best utilize them. As it was mentioned earlier, nowadays third party logistics or warehousing companies can be an option and the decision is up to the company’s management as whether it is financially more efficient to outsource some of these services.

(viii) A significant increase in the number of equipment and system options to be considered in planning warehouse operation. The new technologies introduced, including Electronic Data Interchange (EDI), online communication and automated ordering systems, as well as the internal bar coding processes for optimum data and product retrieval and tracking seem to be a bit complicating in the beginning and need special attention while they are being implemented.

(ix) Demand for integrated upline and downline communications and the challenges of Electronic Data Interchange, automatic identification and compatible information systems. The internet generally facilitates processes but it is not uncommon to create incompatibilities among the different users who need to communicate. Safety in electronic data interchange is also another critical issue nowadays.

(x) The role of the other departments' warehouses and the virtual integration of their inventories. The company as a whole is an organization with different departments that need to coordinate with each other. A warehouse that hosts a specific part of an engine produced by the company for example, needs to know ahead of time about a scheduled order that will be delivered in the future and make sure all the needed quantities are available on time. The lead time of a product is a function of a good coordination.

(xi) Management's increased needs for enhanced measurements and operational accountability. A state-of-the-art inventory control is the key to success. By definition, supply chain management refers to the right quantities, at the right locations, and at the right time.

(xii) The planning, managing and improving of today's warehouse operations require a much more professional approach to warehousing than previously adopted. Keeping a warehouse operating efficiently is a very challenging job that

requires a mathematical approach, a forecasting perspective and an open-minded point of view of the market that needs to be served.

In order to respond to the requirement for competitive, just-in-time transportation services, the countries that want to maintain a powerful role in the global arena, that is countries in category “A”, need to create or expand their multimodal transport sector. For these countries, there are a number of essential steps for the development of an efficient multimodal transport sector; these include developed transportation infrastructure, simplified streamlined documentation, liability regimes, industry standards and the legal status of intermediaries such as freight forwarders. [United Nations, 2001]

Singapore, Hong Kong, Taiwan and Japan are international logistics hubs and are on a track of improvement. They are considered to be developed countries and have proven their status with their successful examples. Transportation infrastructure developed rapidly in many, but not all, countries in Asia in the 1990s.

However, linkages between road, rail, inland waterways and seaports have not always been implemented. In “B” and “C” countries the linkages among the different types of modes, wherever applicable are often missing.

The countries that will not invest in infrastructure development and modernization of logistical procedures will not have a competitive advantage and will not be the preferred customers or partners in the global trading arena. China, Thailand, Malaysia and the

Philippines have been making efforts for improvement in the area. Significant investments have been placed for the development of modern and efficient cargo handling facilities at the maritime ports and warehouses.

Developing countries should learn a lesson from the developed countries and pay attention to the environmental and social effects and the peripheral development in their developmental process. Graham, 1999 explains that the challenge is to combine infrastructure investment with uniform procedures that allow for standardization across borders. When logistics capabilities are more equalized, then choices concerning the movement of goods can be based on the lowest cost and best quality provider.

Mulcahy, 1994 define the warehousing success policy, applicable to “A” and selected “B” countries at this point, as follows:

Operations Planning: Systems and procedures need to be put into effect and allow the warehouse manager to proactively plan the operations as opposed to reactively respond to external circumstances.

Logistics Network: Warehouses should not be viewed as independent operations, but as elements of the overall, well-planned logistics system.

Flexibility: Due to the increase in warehouse pace and variety, all warehouse systems, equipment and people need to be more flexible.

Dealing with Uncertainty: All uncertainty needs to be minimized, and discipline needs to be increased.

Integration: Activities within the warehouse (receive, store, pick, and ship) have to be more integrated within the overall logistics system.

Inventory Management: Real-time warehouse management systems need to utilize cycle counting to manage inventory accuracy.

Space Utilization: Space has to be more efficiently and effectively utilized.

Continuous Flow: A clear focus needs to target on pulling product through the logistics system and not on building huge inventories.

Warehouse Management Systems: A real-time, bar-code based, communication warehouse management system is required to meet today's requirements.

Total Cost of Logistics: The goal has to be the minimization of the total life cycle costs of logistics, from order submission to product delivery, while providing excellence in customer service.

4.2.7 Software and communications, IT infrastructure

A very critical element of successful business operations nowadays is the technology that is used to facilitate the companies' trading services. New technologies such as the Management of Information Systems, Automated Control of Production, MRP and DRP in logistics, automated inventory control, GPS and online order placing are needed for countries and companies that want to improve their efficiency. This is mainly intended for the developed "A" and rapidly developing "B" countries. Unfortunately the "C" countries cannot focus on this level of infrastructure at this point.

Information and communications technologies are bringing a revolution to the scope and scale of e-supply chain infrastructures. Online data exchanges transform businesses' practices, and allow managers to capture and track complex data faster and more effectively. Orders can easily be traced and exchange information among entities within the value chain becomes available, and improves customer-provider relationships. Sharing of information across the supply chain and within the organization is the key to faster and errorless operations. "Intelligent application of information technology can also eliminate duplicative data entry, provide real-time status information, and help organizations move past a myopic view of their processes to view themselves within the context of larger missions and goals." [Integrated Supply Chain Management, 2002]

Sauna-Aho, 1998 refers to a trade transaction that takes place nowadays and involves 26-34 basic documents, with transport accounting for 12-14 of these, or more than 40%, on average. This number depends on the type of trade; that is, for example in Europe, whether the transaction takes place in a country's domestic trade, in intra-EU trade or in trade with third countries. Sauna-Aho, 1998 continues by stating that a trade transaction does not just involve buyer, seller and carrier; normally, there are 20-27 parties per transaction. Flows of physical material, money and information are involved, as well as documents.

There is a growing importance of communications, and a need for more accurate and faster information. In Table 24 below, one can see the EDI and electronic commerce applications in selected countries of the ESCAP region. All "A" and some "B" countries

mentioned below have automated and computerized operations (Japan, the Philippines, South Korea, Singapore, and Thailand), but “C” countries do not (Bhutan, Cambodia, Laos, and Nepal).

Table 24 Electronic Data Interchange and electronic commerce applications in selected countries of the ESCAP region (status as of 2001) [UNESCAP, 2001]

Country	Port procedure computerized	Traders can input data electronically (Port EDI)	Customs procedure computerized	Traders can input data electronically (Customs EDI)	All parties electronically linked	Electronic trade in transport services
Bhutan	–	–	No	No	No	No
Cambodia	No	No	No	No	No	No
Fiji	No	No	Yes	Being implemented	No	No
Indonesia	Yes	Yes	Yes	Being implemented	No	No
Japan	Yes	Yes	Yes	Yes	No	No
Lao People's Dem. Rep.	–	–	No	No	No	No
Nepal	–	–	No	No	No	No
Papua New Guinea	No	No	Yes	Being implemented	No	No
Philippines	Yes	Yes	Yes	Yes	No	No
Republic of Korea	Yes	Yes	Yes	Yes	Yes	Yes
Singapore	Yes	Yes	Yes	Yes	Yes	Yes
Sri Lanka	Yes	Yes	No	No	No	No
Thailand	Yes	Yes	Yes	Yes	Yes	Yes
Viet Nam	No	No	No	No	No	No

Source: Data collected by the ESCAP secretariat and based on replies to questionnaires, country reports presented at ESCAP seminars and workshops, and findings from field missions.

The Table below presents the changing role of the “A” countries in the past years, towards increased high-technology commodities along with their sophistication in logistics and handling. These countries were able to develop and change their focus, and their success depends highly on their infrastructure.

Table 25 The Change of Role of Selected Asian Countries to Production and Trading of High Technology Commodities [Krumm, 2003]

	Resource based		Low/medium technology		High technology	
	%	%	%	%	%	%
Country	1985	1996	1985	1996	1985	1996
Hong Kong	2.1	4.4	78.5	66.7	19.4	28.9
Singapore	42.3	12.7	25.4	21.9	32.3	65.4
Korea	7.8	9.4	72.1	55	20.1	35.6
Taiwan	8.7	5.1	70.6	54.1	20.7	40.8
Indonesia	72.2	34.9	25.1	50.4	2.7	14.7
Malaysia	53.7	17.8	15.2	21.8	31.1	60.4
Thailand	42.1	14.5	44.8	49.1	13.1	36.4
China	11.7	9.8	78.9	69.7	9.4	20.5

There is a potential for further improvement of the countries in the region and many efforts have to be made in order for the companies to catch up with the global competition. Therefore, the governments should encourage and give motives to logistics companies, carriers, and hub providers to invest in technology, educate their workforce and become leaders in the world's supply chain. [Graham, 1999]

The Trans-Eurasia Information Network is an example of the growing needs for better and more accurate communication. It was built in order to contribute to enhance exchanges and cooperation between Asia and Europe through increased and more effective information flows, and to expand and diversify speedier and more powerful telecommunication connections. The demand for this network was high and the traffic congestion occurred from the very beginning (06/12/01~10/12/01).

Strong demand for upgrading was raised and even though the link capacity increased since 01 March 2002 from SCR 2Mbps/PCR 4Mbps, to 10Mbps/20Mbps, traffic

congestion demands even further increase of capacity. In Figure 34 below, one can see the traffic of TEIN in the beginning of its operation. In Figure 35 one can see the topology of the network and the involving countries.

Figure 34 Traffic at TEIN [Roh, 2003]

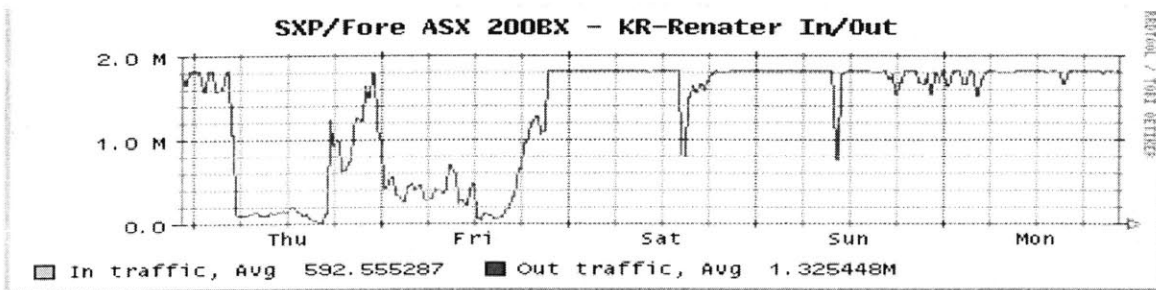
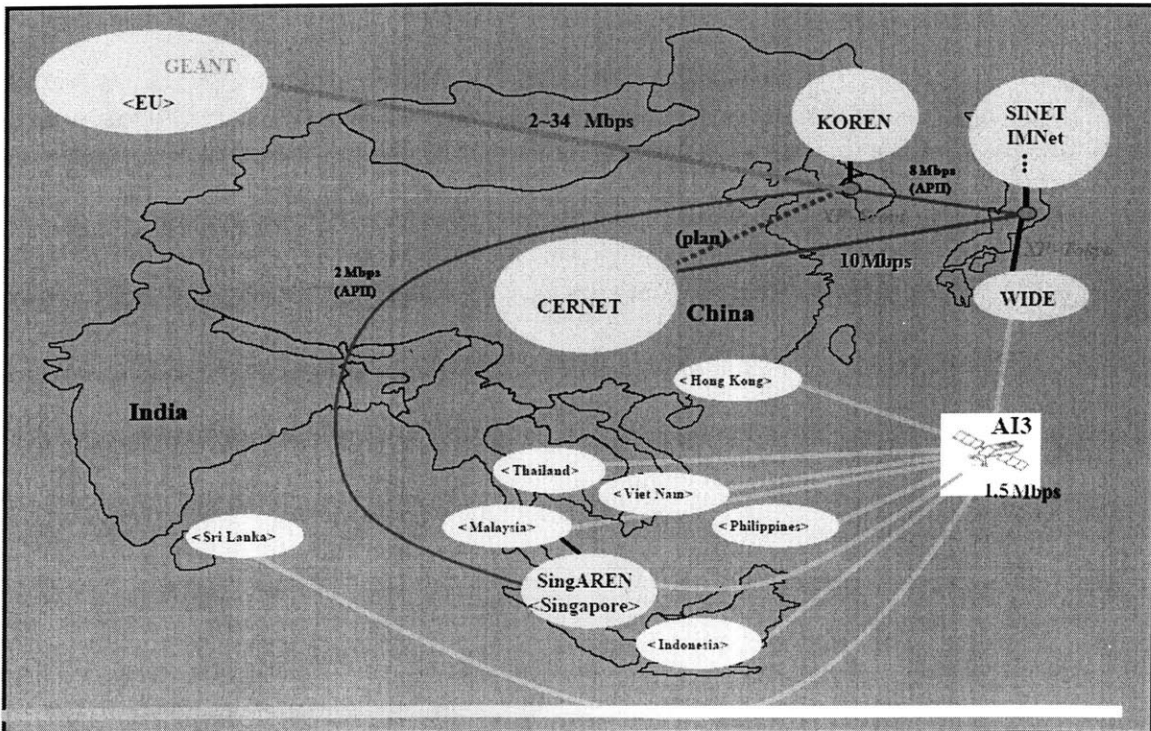


Figure 35 Network Topology [Roh, 2003]



As an ultimate example of need for use of high technology systems, “several countries in the Pacific region have begun to introduce the automated system of customs data (ASYCUDA) developed by the United Nations Conference on Trade and Development (UNCTAD). However, there still remains considerable work to be done to standardize and computerize documents. This is particularly relevant across borders where incompatible customs and immigration procedures impose additional costs on shippers.”
[United Nations, 2001]

Electronic Data Interchange (EDI) is a very useful tool that allows the shipper and receiver of products, as well as the public administrations involved, to access information in order to:

- control the service, check reliability and timeframe;
- be informed of incidents/delays in order to take action (e.g. modify the production planning, reroute other consignments, etc.);
- change routing/destination orders to the freight forwarder/operator; have flexibility for internal reasons; group numerous shipments;
- communicate with other involving parties through EDI messages;
- have early notification of cargo to prepare the needed paperwork;
- have early notification of cargo to have greater flexibility in the planning of staff utilization;
- keep easy and accurate data on cargo by type, quantity and origin/destination.

4.3 Developmental programs

Foreign Direct Investment in Asia has surged, as it shows in the following Figure.

Figure 36 Foreign Direct Investment in Asia [Boeing, 2003]



The World Bank, the World Trade Organization, the Asian Development Bank, the Organization for Economic Cooperation and Development, the UNESCAP, the ECMT, the UN-ECE, the United Nations, the European Union, along with many other organizations have turned their eyes to Asia and assist in the development of transportation and logistical infrastructure.

On the other side, in Asia, the Asia Pacific Economic Cooperation (APEC), the ASEAN, and the ASEAN Free Trade Area (AFTA) are from their part trying to absorb as much financing as possible for the development of the area.

“The APEC vision clearly includes liberalization of investment and capital movements. Increases in such flows will contribute to economic progress in the region, and the program recognizes the central role played by the private sector in the Asia Pacific integration process.”[62] “The purpose of AFTA is to promote the export-led growth of member countries of ASEAN by creating and expanding trade which, in turn, will induce more direct foreign investment (FDI) into the area. AFTA intends to assist ASEAN members in ways that conform to GATT principles.” [IPAP, 2003]

4.4 Summary

In general terms, the transportation system has to be made efficient, and trade and transport regulations harmonized. The transportation infrastructure that constrains growth needs to be improved or redesigned and replaced, and the system capacity has to increase.

A well-designed road network, including highways, offers great accessibility, speed, small carrying capacity, flexibility, and friendly cost structure (10% fixed costs of motor carrier, 90% variable) to the transportation carrier, wherever trade is allowed through connected regions.

“A” countries seem to have a well-operating highway system and are making significant progresses at an urban level as well in order to fight congestion. Highly developed urban transportation is also available. “B” countries have to improve their highway systems and interconnect them with the other existing network in their neighboring countries and also with the other modes of transportation that exist within their region. While “A” and “B”

countries need to improve and excel, “C” countries have to focus on building the basic infrastructure that is missing. Unpaved roads and few paved routes do not facilitate trade and do not attract neighboring countries to pass their commodities through.

In railroads, the corridors exist and operate successfully in the “A” countries. Many “B” countries need to improve their existing infrastructure and ultimately gain a significant distance advantage over the existing shipping routes. In most of the cases, the “C” countries have to build a network from the beginning or extend it at a very high level because as is, it is inadequate to serve any trade operations. In contrast to the road network that is more independent, in railways technical issues, such as the structure gauge, the axle loads, and the commercial speeds need to be decided among all the countries that are going to potentially utilize them.

In the sea transportation, “A” countries such as Hong Kong, and Taiwan need to increase the size of container terminals since the demand for land backing has risen along with the increases in vessel size. They also need to acquire different equipment (e.g. post-Panamax cranes that are taller with a longer outreach) and ensure deep water, and direct intermodal connections. Larger vessels also bring with them a need for better handling performance and container management in order to ensure minimum time spent in port. This need is met in part by investment in increasingly sophisticated information technology system. “B” countries have to improve their port facilities in order to become less time-consuming and adapt faster to the fluctuations of the demand. “C” countries need to build basic facilities and acquire basic equipment in order to have the sea

transportation option available. “B” and “C” countries need to invest more in their inland waterways and integrate all their various transportation modes. Intermodality is what is needed.

The new era in transportation practices requires for Asia development and expansion of the existing port facilities; improved utilization for better efficiency and productivity of port operations; enhancing port capacities; promotion of multimodalism; development and improvement of auxiliary services; development and improvement of land-side transportation; enhancing and promoting automation and use of computers in port operations; and promotion of Electronic Data Interchange (EDI). [Hin Wei, 2003]

EDI is coming into use in transport and trade, and EDIFACT messages may be used to replace documents. Those messages are listed, and ways to avoid overlapping documents are mapped out. EDI can reduce the number of transport documents by over 40% in domestic and intra-EU trade, and by about 35% in foreign trade. EDI results in more savings in transport specifically than in trade more generally, on average.

In general, for container shippers, the following service attributes are considered to be important in arriving at decisions about mode and route choice [UNESCAP, 2002]:

- overall level of transportation and handling cost, including the tariffs and charges paid;
- transit time, representing the time from origin to destination point;

- consignment security, or the extent to which consignments will be secure from damage or pilferage en route;
- reliability of service, frequency and acceptable error in delivery times;
- comprehensiveness of service provided by operators, including the acceptance of responsibility for all components of the transportation/handling chain between origin and destination; and
- availability of real time information on the location of a freight consignment or container at any point in its journey between origin and ultimate destination.

Chapter Five: The Governmental Role

5.1 Understanding the Importance of Transportation Infrastructure and Logistics for Trade by the Governments

Governments in all three categories of countries seem to understand the value of the role of successful domestic companies in improving their economic performance and viability. A competitive company means a profitable company and payable taxes to the government. It also means lower unemployment rates, less crime, and a better quality of life. It is recognized that in utilizing logistics to create value, domestic firms improve their international competitiveness. This is the foundation for the economic growth of the countries. [Des Powell, 2001]

5.2 General Issues That Need to Be Addressed

Gercek, 1998 and Engel, 1998 identify the obstacles that exist in the transportation network of “B” and “C” countries in the region. These barriers to trade need to be addressed in order for a trade facilitating network to be implemented. These include:

- Various differing types of road networks, and national roads of insufficient quality and capacity,
- Poor transborder connections, and delays at borders due to a lack of 24 hour services or a general lack of border facilities, and restrictions on freedom to use border crossings,

- Few and poorly located terminals for combined transportation,
- Differing standards of weights and dimensions for goods vehicles,
- Lack of standardisation of railway traction, signalling and telecommunication devices, track gauge, voltages and clearances,
- Lack of storage equipment at main railway stations,
- Incompatibility between freight and passenger transport by rail,
- Insufficient capacity and growing inefficiency on inland waterways,
- Lack of direct, multimodal links between seaports and the hinterlands, and,
- Not enough high capacity, high quality, reliable information and telecommunications systems.

From the software infrastructure side, the problems that exist include:

- Inadequate route planning systems on road networks,
- Low level of traffic management and control,
- Poor railway management and poor service quality,
- Unsatisfactory and unreliable statistics on trade flows, and,
- Lack of informatics in general and EDI systems in particular.

As far as the institutions are concerned, often, there is:

- Insufficient communication among participating countries,
- Slow border procedures due to the need to produce complete documentation even for transit shipments. Generally, too much bureaucracy,
- Lack of interchange agreements for wagons and other special equipment, and,

- High transit costs due to local charges, fines and “unofficial” payments at checkpoints and uncertainty on future transport fees, and fines or delays due to differing transport laws and regulations.

Finance is the means for the creation of infrastructure and operation of the network.

Problems concerning this include:

- Insufficient public budgets to finance investments,
- Lack of private sector investment in infrastructure, and,
- Long planning, construction and investment periods.

Finally, the environmental issues that need to be addressed are the following:

- Growing pollution — air, water, noise and visual — caused by transport systems, and,
- Resistance to new investment in roads and terminals.

5.3 Major Gaps and Issues in the Conventional Transportation Planning Process in Developing Countries

[Conklin, 1999] and [Kumar, 2003] describe some of the major gaps and issues in the conventional transportation planning process in developing countries. These are the following:

(i) Intermodalism: It involves transportation by more than one form of carrier during a single journey. The use of a combination of interconnected modes to transport passengers or freight is a complicated optimization problem that requires integrated rather than

unimodal approach.

(ii) Technology Scanning: The use of new technologies in transportation can have a great impact on the performance and competitiveness and can eventually improve the service level and the total travel\transport times. Tracking techniques such as bar codes at a micro\user optimum level, as well as demand forecasting and the use of Intelligent Transportation Systems at a macro\system-optimum level can assist in the overall quality of transportation.

(iii) Freight Movement: The regional economic development is a function of the passenger and freight flows from and towards a region. The transportation planning procedures should carefully allocate the needs and give equal and sometimes higher importance to freight.

(iv) Private Sector Participation: The infrastructure development process should attract funds from private agencies and the business community. The public sector agencies often do not allow other than governmental funding of major transportation investments. In that case deregulation is the key to faster and more efficient transport solutions.

(v) Transport-Economy Linkages: Transportation is a leading factor for the economic standing of a nation. Globalization has shortened the distances and destroyed the barriers that once existed among countries and oceans. Transportation is the means that allows efficient communication with the rest of the world. Investments in proven needed

transportation infrastructure projects should be a priority for developing economies.

(vi) Strategic Perspective: The investments in transportation infrastructure should have an identified goal. A project needs to be considered in its entirety in order to be successful and worth-building.

(vii) Human Resources Development: The most important asset in the planning process of the transportation projects is the people who design and decide what needs to be done. Open-minded professionals with the ability to prioritize and stay intact from corruption are needed in order to pass out the knowledge and experience to more and more transportation engineers, regional planners, architects and policy makers.

5.4 The Policy Agenda: Big Picture

Infrastructure is one part of the logistics policy. The current situation in the Middle East and the war in the former Yugoslavia have put an obstacle in the development of the trade routes. The ongoing procedures that will eventually carry peace to the region and eliminate terrorism and fear are going to assist the overall efforts of building new connections between the two continents.

Initially, the domestic integration is an important prerequisite before the international integration. All of the benefits of improved logistics and trade apply first to domestic trade and then to international trade. It may be foolish to talk about accessing international markets when it is difficult to access internal markets.

Below are the most critical of all policy steps needed to be taken by the countries in Asia.

5.4.1 Regulation/Deregulation

Today, many infrastructure providers are private companies. It is sometimes necessary for governments, sometimes on “B” countries, but mostly in “C”, to observe and regulate the national projects in order to prevent undesirable behavior, actions and activities, respond to market failures, limit abuses of market power, and improve economic efficiency by establishing specific rules or commands. The active participation of government with legislative, organizational and financial measures is very crucial. Profits for developing countries do not come only through improved access for their exports. The reasons for a public agency to pursue regulatory techniques are the following:

- (i) Monopolies and natural monopolies need to be regulated so that the lack of competition does not give the wrong impression and limit the quality of the work.
- (ii) Windfall profits have to be controlled and cannot exceed a logical limit.
- (iii) Externalities should be avoided.
- (iv) Information inadequacies should not exist and research should be done in depth. Infrastructure companies need to support all their steps.
- (v) Continuity and availability of services needs to be secured.
- (vi) Anti-competitive behavior and predatory pricing cannot exist because of the economic losses that will bring to the country and its people.
- (vii) Public goods and public hazard have to be taken into consideration. Safety has to be

a critical issue.

(viii) Rationalization and coordination has to be maintained throughout the whole project development.

(ix) Planning needs to be concrete and rational. The timeframe needs to be maintained.

(x) Unequal bargaining power cannot be allowed in favor of personal interest.

(xi) Distribution and social justice need to be kept intact because after all the country's infrastructure is there for everybody to use, lastly,

(xii) Fair competition and investor confidence has to be maintained and secured for the economic efficiency of the project.

5.4.2 Private Sector Partnership

The governments in Asia (even those in category "A") cannot face the increased demands for capital investment and cover it in full by public expenditure. The private sector will need to provide a significant share of this investment and related risks and benefits.

Countries in categories "B" and especially "C" need to open their borders to Foreign Direct Investment (FDI) in addition to the financial aid that they are receiving by the international organizations. Governments in collaboration with their financial institutions could implement mechanisms that allow public-private partnerships. These partnerships will offer varying risk levels, resource inputs and involvement of the partners and will contribute partially in the assets, resources, technology, management and operational expertise.

“Progress was made in many countries of the region in applying new approaches to financing, such as the build-operate-transfer (BOT) and other forms of concession funding as well as the use of tolls and sales taxes on motor vehicle purchases. China, India, Malaysia, Pakistan and Thailand have been exploring various types of financing.”[UNESCAP, 2001]

5.4.3 Tariffs and Taxes and Liberalized Environment

Developing countries in categories “B” and “C” have much to gain from trade by quitting their trade-restricting policies and practices. The available evidence suggests that open economies have faster growth rates than closed economies. [Zhada, 2003] Liberalization by developing countries is as critical as the infrastructure itself. Competitive domestic markets are a necessary condition for improving their rate of growth.

Zhada, 2003 presents in his study that manufacturing exports from developing countries to developed countries face an effective tariff 4 times higher than that on exports between developed countries. Tariffs on trade between developing are also much higher than those in developed countries. In the same study, another study published by the EU Commission claims that of the \$400 billion gains from liberalization, developing countries would gain \$140 billion a year; more than the EU (\$92bn) and the US (\$45bn). In “C” countries, import quotas, export licensing requirements and transport restrictions, as well as cumbersome, arbitrary and often corrupt bureaucracies do not facilitate trade and need to be changed.

Trade liberalization can also help the alleviation of poverty. In East Asia there are examples where the opening of the markets led to higher wages and lower poverty. [Zhada, 2003] Trade openness and the “invisible hand” of Adam Smith benefit the productivity rate, the adoption of new technologies and the attraction and implementation of investment. This is how trade leads to economic growth. Still, it is not rare that the potential of a developing country to become more competitive sometimes gets trapped behind-the-border institutional and regulatory reforms.

5.4.4 Intermodal Integration

This is a priority for all the countries of the region. The “A” countries have managed to achieve it and the majority of “B” countries are working on it. Intermodal integration is needed in urban transportation, as well as for the increasing volumes of freight that place great stress on the land transport interface and generate a need for faster and more efficient intermodal connections to the hinterlands.

Especially “B” and “C” countries should identify the bottlenecks in their network and implement efficient intermodal transport and logistics systems. Graham, 1999 says that process times not only add cost to the value of the imported and exported items, they also logjam the port, airport and road systems and increase the avenues for corruption. “A” countries need to use sophisticated planning and forecasting tools in order to keep their competitive advantage and be able to respond to the continuously increasing volumes.

5.4.5 Sustainable Transportation

Richardson, et. al., 2000 and a report of the United Nations, 2002 refer to sustainable transportation development and draw it in three dimensions:

- economic sustainability (economic efficiency), a sustainable developmental project needs to be chosen from a cost-benefit analysis as the most favorable for implementation and feasible for the achievement of long-term goals;
- environmental sustainability (ecological stability): this requires that the environmental balance is not ignored by human decisions in order to preserve the functional stability of present eco-systems, both on a local and global scale;
- social sustainability (distributional/social equity): fair distribution of resources, poverty reduction, stable human development, public participation, and democratic policy formation.

All countries of the region need to implement sustainable development, both the countries that have infrastructure in place and have some externalities and these that need to build basic infrastructure for the first time. The keys to a successful, sustainable transportation network are for a government to:

- Conceptualize a comprehensive transport strategy;
- Evaluate the feasibility of economic instruments;
- Determine the institutional requirements for implementation and control;
- Determine revenue allocation;

- Determine adjustment period and schedule for implementation;
- Raise public awareness and acceptance; and,
- Force a balanced regional and peripheral development.

The damages that can occur to the environment in the developmental process of a transportation project are very significant. Infrastructure development, the construction, maintenance, rehabilitation, expansion and upgrading of the transportation networks may cause environmental degradation as a result of poor environmental planning. Especially in Asia, where the transportation infrastructure is going to continue changing for the following decades, special attention should be paid to the environment and the predicted impacts.

“In some cases, the adverse impacts are so severe that they offset their benefits of facilitated linkages, enhanced mobility and improved accessibility.” [United Nations, 2001] The consequences of a poorly planned environmental impact analysis can be destructive for the natural non- living environment, as well as the living, and the human and social environment.

For the natural non-living environment what should be avoided are the topography destruction and the damage to landscape. Slope failures and mass movements can influence the natural flow of air and water in the area and can spread dust, debris and waste in the air, water and land.

The natural environment is of great importance for the local people and a possible erosion and loss of productive soils, disruption to surface water run-off system and groundwater system, or contamination of the soils and water bodies can bring unwanted effects to the agriculture and the health of the habitants.

In the natural living environment a destructive transportation infrastructure project may result in forest destruction. Destruction of vegetation and pollution might cause disruption or contamination of the flora and fauna of the area and that can lead to uncontrollable ecological destabilization. Drying and flooding might also occur. The uncontrolled usage of waste materials, equipment lubricants, fuels and detergents can worsen the quality of the environment. The emissions generated through construction activity, machinery and vehicular traffic is also destructive for the human health and the environment.

Even in developed countries transportation project have great externalities. It is not unusual for urban planners to fail to predict the great consequence of a newly built high-speed rail line going through a poor and undeveloped suburb of a city. Habitat intrusion should be also taken into consideration.

Finally, the impact in the human and social environment can be seen in the determination of the agriculture, horticulture and aquaculture of the area. This will eventually result to the disturbance of the economic activities, depending on how much the country's GDP depends on one or more of the above economic sectors. For the ecosystem as a whole, the

disappearance of reproduction and food zones for fish, aquatic and migratory birds from the increase in poaching and subsequent hunting and fishing is a great loss.

The people's health and safety can be deteriorated. The possible contamination of the water, the air pollution, the noise disturbance, the disturbance by vibration, and the obstructions/unsafe conditions owing to presence of road side poles, ditches, and barriers are some of the consequences that might occur.

The disturbance to human settlements, residences and workplaces (e.g. loss of road side community business) might cause loss of community cohesiveness, and disruption of the cultural heritage (damage of sites, structures and remains of archaeological, historical, religious and cultural value), as well as sometimes impairment of aesthetics.

A UNESCAP report in 2001 found the Environmental Impact Assessment implementation in the region unsatisfactory, with no continuity and follow-up. The responsible agencies' roles were not well-defined, and resulted in a severe lack of coordination and monitoring. Little commitment was noticed from the governments' side. The environmental awareness should be high because the environment is of primary importance in the project planning, design and construction. It is not a formal procedure that needs to be executed simply for the project approval but a sign that will later on reflect whether the project was successful or not.

Local authorities cannot directly adopt rules and guidelines used in developed countries. The differences in technology and practices, the unique local conditions, as well as political and social environments do not allow the adaptation of foreign practices. Finally, public participation should be encouraged in the ESCAP region.

An institutional framework and expertise to implement Environmental Impact Assessment is what is lacking from the area. The decision makers, planners and government officials need to understand the importance of the environment for the area in the implementation process of a transportation project.

5.6 Summary

The policy recommendations for all the countries include:

- Intermodal integration
- Sustainable transportation and,
- Private sector partnership and allocation of funds

While countries “C” and few of “B” need to check on the imposed tariffs and taxes, consider liberalization of their operations and deal with the creation of a basic network sufficient for international and interregional trade, “A” countries should examine more efficient warehousing techniques (storage, production management, order placing, and product tracking)

Chapter Six: Summary, Conclusions and Recommendations

6.1 Overview

The particular focus of this thesis was the collaboration between Asia and Europe for several reasons. First, the European Union is institutionally new and is trying to build a strong relationship with Asia, which is something that has already been done between the USA and Asia. There is great interest in Europe to see the improvement and creation of missing infrastructure and implementation of a complete and reliable network in the area. Europe seeks better access not only for improved import techniques but also for export. Moreover, Asia has been depending on the USA for years, by having main production lines devoted to the Americas, and needs to break this dependence. Asia wants to do more business with European partners and believes that this will lead to a more successful future.

Second, the infrastructure needed for efficient transportation between Europe and Asia does not mainly involve ports, such as is the case between Asian countries and the Americas. Crossing the ocean is the only way for the latter, given the fact that most industry in Asia is located by the sea and close to major ports, although agricultural and some other products do need roads and railways in order to get to the ports. The regional rail and highway system that is in place is not fully integrated, fails to satisfy the demand for freight transportation, and does not offer options for reliable intermodal transportation.

Finally, even in the case of shipping and port facilities the trend of building larger vessels implies that additional routes will be created through Europe to the United States, via the Suez Canal. The same vessels that will continue to the America will first stop at a hub in the Mediterranean Sea or several ports in order to load and unload freight in Europe.

The contribution of this thesis includes policy suggestions to governments and agencies in the area as well. The regulation and deregulation option is discussed, as well as the needs for private sector partnerships in the transportation infrastructure developmental process especially in the poorest “B” and “C” countries of the study. The obstacles of tariffs and taxes are discussed and the governments’ role in the liberalization of the environment is stated in the process of trade facilitation. Finally, intermodal integration and sustainable transportation is suggested for all the countries of the region as a general rule of success for the region with minimum externalities.

6.2 Contribution and Major Findings

This thesis is motivated by the anticipated growth of demand for imports and exports between Asia and Europe. It analyzes and emphasizes the importance of transportation and logistical infrastructure in facilitating trade. It also examines the existing transportation and logistical infrastructure in Asian countries, making a comparison among them and pointing out the sectors that need to be improved. Better organized and more extensive networks can be utilized to develop diversified economies, improve existing conditions and attract more investment to undeveloped or underdeveloped regions. In Table 26, one can see the Asian countries divided in their categories by their

level of infrastructure. Depending on the volume and importance of trade for each country, as well as the type of commodities imported and exported, the countries are blocked in three different categories.

Table 26 ABC countries

“A” countries	“B” countries	“C” countries
Japan	China	Afghanistan,
Singapore	Malaysia	Georgia
Hong Kong	Philippines	Pakistan
Macau	Indonesia	Kyrgyzstan
South Korea	Thailand	Tajikistan
Israel	Russia	Iraq
Taiwan	Vietnam	Uzbekistan
Kuwait	India	Mongolia
United Arab Emirates	Kazakhstan	Yemen
Saudi Arabia	Azerbaijan	Laos
Bahrain	Armenia	North Korea
Oman	Turkmenistan	Bangladesh
Qatar	Syria	Bhutan
Brunei	Iran	Nepal
	Turkey	Burma
	Sri Lanka	Cambodia
	Jordan	
	Lebanon	

Table 27 shows the level of infrastructure and the characterization of policies for these countries.

Table 27 Level of infrastructure and characterization of policies in the Asian countries

Level of infrastructure/Countries	“A”	“B”	“C”
Urban	Adequate, needs ITS and better synchronization of the public transit modes to reduce congestion	Varies, mostly existent, needs improvement of coordination among the various modes of public transit, faces serious problems of congestion	Inadequate, lack of public transit modes, old vehicles operate on unpaved roads, danger for the environment
Road	Adequate, needs optimization techniques	Varies, mostly existent, needs to connect to the other modes of transportation, and a higher pavement ratio	Inadequate, largely unpaved network, lack of connectivity among modes
Rail	Adequate, technologically advanced in many cases, fast and reliable service	Varies, mostly implemented, needs expansion in order to connect with the rest of the modes	Inadequate, lack of mode in some cases, lack of corridors, technologically obsolete, unable to handle freight traffic, low speeds, low capacity
Sea	Adequate, port facilities in good condition, challenged by the increasing vessel size	Varies, few adequate ports, lack of integration to the whole transportation system, capacity constrained	Inadequate, wherever applicable port facilities are not sufficient to be utilized by carriers
Air	Adequate, advanced airports, high pavement ratio	Varies, numerous airports are not paved and have low capacity capabilities	Inadequate, few paved airports that are not strategically placed or developed in order to facilitate trade and handle freight capacity
Logistics	Adequate, facilities limited by space constraint, implementation of supply chain management techniques	Varies, lack of integration within the modes is an obstacle	Inadequate, inexistent
IT	Adequate, integrated part of the operations, improving	Varies, introduced but not widely implemented	Inadequate, inexistent
Policies	Beneficial, open capitalized markets, attracting FDI and receiving support	Diverse, mostly open to private funding and attracting FDI, need strategies for better cooperation and lower taxation and tariffs	Limiting, high taxation and tariffs imposed, low cooperation with neighboring countries

This thesis also points out the needs and priorities for the network, the existing facilities and the policies in the countries of the region. These are shown in Table 28. For every category the priorities rank differently starting from the top with the most critical one.

Table 28 Priorities that need to be implemented in the Asian countries

“A” countries	“B” countries	“C” countries
Improve capacity utilization of the existing network	Add infrastructure in all the different modes of transportation sufficient for international and interregional trade	Allow allocation of funds
Add connections to the network that will minimize travel times	Finalize connections within the rail, ocean, and trucking industry to facilitate multimodal trade	Create basic infrastructure in all the different modes of transportation sufficient for international and interregional trade
	Expand the capacity of existing routes to keep pace with traffic	
Implement ITS, GPS, e-commerce, EDI and other new technologies to a full extent	Allow allocation of funds	Connect the modes that are available
Facilitate freight mobility in congested urban areas	Respond to congestion	Maintain a political stability in the region
	Expand and improve the terminal facilities	
Expand and improve the terminal facilities	Allow paperwork clearance for inland travel of containers	Allow unfettered foreign investment in transport/logistics services
Optimize the network	Consolidate rail, ocean, trucking regulatory agencies to facilitate multimodal trade	Remove taxation and tariffs from the freight that intends to pass through the network
Sustain security in the network	Allow unfettered foreign investment in transport/logistics services	Remove distortionary queuing priorities for commodities accessing transport system
Use efficient warehousing techniques (storage, production management, order placing, and product tracking)	Remove distortionary queuing priorities for commodities accessing transport system	Transparency of applicable laws and minimization of legal barriers to market entry

6.3 Recommendations

The level of financial support provided by the international organizations could provide a good measurement on the attention attracted by each country or each category of countries separately. Further study would examine the social response to the bad infrastructure and economic conditions of countries, such as Nepal, Mongolia, and Afghanistan. The level of assistance will boost these economies earlier than they themselves will be able to change policies and overcome their economic stagnation.

At a regional level, in order to insure balanced development of the area and minimum unfairness to people the researcher needs to examine whether the funds coming from international organizations are divided and spread according to the needs. It is also crucial that the stages of the developmental processes are concrete and are being followed according to the schedule. A study can compare the allocation of funds with the identified needs presented in Table 28. Further research is needed to see how this can be done.

At a country level, the developmental process of the infrastructure that is currently being built is another critical issue. It is important that the allocation of funds goes toward the right priorities in each country and satisfies the need for global interconnectivity of the modes and improvement of the modes and not only personal interests.

Finally, the level of peripheral development should be examined. The Asian countries need to decentralize their population and improve the living conditions of all, particularly

of those who live in the rural areas. If the researcher needs to target specific countries an examination of the existing infrastructure and a detailed assessment of the needs and potentials will be necessary.

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