Chapter 2

Supporting Regional Trade and Investment

2. Supporting Regional Trade and Investment

Asia's reemergence as an economic powerhouse in recent decades—and its recovery from the 1997–1998 financial crisis—owes much to the expansion of its international trade. This has been fostered by the development of supporting infrastructure, both hard (physical) and soft (institutional), and of efficient logistics services—the well-managed distribution and storage of goods, services, and related information through firms' supply chains—that make the best possible use of trade-related infrastructure.[8]

Investments in production facilities and the resulting trade depend on infrastructure investments that reduce trade costs, improve access to markets and suppliers, and enhance international competitiveness. Through a virtuous cycle of infrastructure development, outward-oriented policies, and integration into global supply chains and regional cooperation frameworks, Asia stimulates trade and foreign investment, benefiting from market-driven integration. As logistics have improved and openness to foreign direct investment (FDI) has increased, international supply chains that crisscross the region have developed, supported by greater financial integration. For instance, a product for export to the United States (US) may be assembled in the PRC from parts manufactured around the region. And as economies

[8] Between 1975 and 1995, developing Asia's port capacity swelled from 3 million to 62 million twenty-foot-equivalent units (TEU)—an average annual expansion of over 15%. Over the same period, airfreight shipments in the region soared from under 2 billion to over 30 billion ton-kilometers, an annual rise of some 14% (Brooks 2008).

become more deeply involved in global production networks, they can benefit more from trade-related infrastructure investment, notably in transport and telecommunications.[9]

Asia's trade-supporting infrastructure now needs further improvements to maintain the competitiveness of existing production networks and widen their benefits, notably to inland areas. For example, almost two thirds of the cost of transporting goods from Chongqing in the PRC to the west coast of the US is incurred within the PRC, in transit to the port from which the goods are exported (Ma and Zhang 2009). Willoughby (2004) found that transport costs for a typical landlocked country were 50% higher than for a coastal country, that trade volumes were 60% lower, and that a 10% reduction in transport costs would increase trade by 25%. A multicountry study showed that a 20% reduction in logistics costs would increase the share of trade in GDP by more than 10 percentage points in Cambodia, the PRC, and the Lao PDR; by more than 15 in Mongolia; and by more than 20 in Papua New Guinea (Carruthers and Bajpai 2003). A background paper prepared for this study (Bhattacharyay and Rahman 2009) found that improvements in both physical infrastructure and the rules and regulations supporting it significantly increased trade in Asia.[10] Brooks (2008) concluded from the available empirical evidence that countries with better trade-supporting infrastructure trade more.

[9] Francois and Manchin (2007) found that infrastructure is a key determinant not only of export levels, but also of the likelihood of exporting at all.

[10] The study used a gravity model covering PRC; India; Japan; Republic of Korea; Taipei,China; and seven ASEAN countries (Cambodia, Indonesia, Malaysia, Philippines, Singapore, Thailand, and Viet Nam) between 2002 and 2006. Physical infrastructure was measured through a composite index of telecommunications (fixed-line and mobile-phone subscribers per 100 people) and transport (kilometers of roads and railways per thousand people) infrastructure. Soft infrastructure was measured through a composite index of three attributes of a country's business environment. These attributes are: (i) time required to enforce a contract—i.e., from the filing of a lawsuit to the final judgement to, when necessary, payment; (ii) time required to start a new business; and (iii) time to resolve insolvency—i.e., from filing for insolvency in court until the resolution of distressed assets.

Improvements in logistics benefit an economy in several ways. They can reduce distribution margins, narrowing the gap between producer and consumer prices and thus improving economic welfare. They can lower firms' marginal costs and generate greater economies of scale in production, transport, and marketing—increasing the potential for export (and domestic) sales. By increasing productivity and fostering international trade, better infrastructure also boosts economic growth and reduces poverty. And as it expands a country's domestic markets and its export potential, infrastructure stimulates links among different sectors; encourages competition, innovation, and entrepreneurship; and generates a dynamic increase in growth. Supportive rules and institutions are as important as physical infrastructure. Predictable legal rights and procedures, a robust competition policy, and an effective regulatory framework are crucial. Financial services—including financial intermediation, risk management, payment and clearing services, and the availability of adequate credit and foreign exchange at reasonable rates—are especially important for facilitating international trade, as the current financial crisis has highlighted.

As Asian economies have liberalized their trade policies, infrastructure deficiencies have become an increasingly significant impediment to trade. In a study of eight sectors in 10 Asian countries, infrastructure quality and transport costs were found to be the leading determinants (along with tariffs) of cross-country variations in trade flows after controlling for distance. Infrastructure improvements would do more to lower the cost, and hence increase the volume, of trade in Asia than eliminating the remaining tariffs and nontariff barriers.[11] A 10% reduction in transport costs (expressed as an ad valorem tariff equivalent) would boost Asia's trade by 3–4% (De 2008). As Asia

[11] Trade costs are a central determinant of trade volumes. For instance, Jacks et al. (2008) found that declining trade costs explain more than half of the pre-World War I (1870–1913) surge in global trade and around a third of post-World War II trade growth, while a steep rise in trade costs explains the entire trade collapse between the two wars.

multiplies its efforts to broaden and deepen regional trade through subregional forums such as ASEAN as well as wider ones such as ASEAN plus the PRC, Japan, and Korea (ASEAN+3), there is a growing need for regional cooperation to maximize the gains from the positive spillovers of investment in infrastructure networks. The potential gains are substantial: a virtuous circle whereby enhanced regional cooperation in trade and logistics bolsters Asia's economic growth and integration, which in turn fosters greater investment in regional infrastructure, and so on.

This chapter presents an overview of the state of Asia's trade-related infrastructure. It then discusses the rapid growth of Asia's trade and how infrastructure improvements lower trade costs and facilitate trade. It identifies areas and means in which regional cooperation could aid the development of trade-supporting infrastructure, underpinning and extending regional production networks and responding to an ever-changing economic environment. The chapter also has an important section on an often-neglected area of potential trade: energy.

2.1. Overview of Asia's Infrastructure

While some Asian countries have far better infrastructure than others, overall, the region remains below the world average in terms of both its quantity and its quality (ADB 2007b, Economic Research Institute for ASEAN and East Asia 2007). This section provides an overview of Asia's transport, communication, and energy infrastructure, and an assessment of its quality. Tables A2.1 and A2.2 in the Appendix provide detailed comparative figures for road, rail, and air transport. Asian countries have very wide gaps in terms of infrastructure attainment, where the regional infrastructure inequalities between countries have widened rather than narrowed over time (Kumar and De 2008).

Transport

Transport infrastructure has generally improved in the region in recent decades, albeit with huge variance by country and transport mode (UNESCAP 2006a). Countries with coastlines are more oriented towards their major ports, while internal land transport systems are not always properly linked due to a lack of comprehensive policies joining different transport modes and logistics networks.

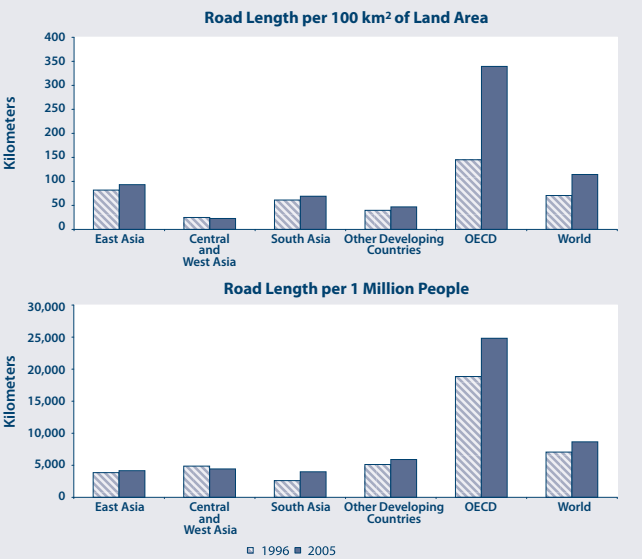
Seaports have expanded rapidly over the last decade and a half. Singapore was the world's busiest port in 2007, narrowly ahead of Shanghai. The ports of the PRC, together with those of Hong Kong, China and Taipei,China, accounted for more than 28% of world container port throughput in 2007. Tanjung Pelepas, established in Malaysia in 2001, has already surpassed New York despite its proximity to Singapore (UNCTAD 2008). The PRC's current (2006–2010) five-year plan aims to increase port throughput volume by at least 80% and container throughput volume by 70%.

Air transport is soaring in much of Asia. The volume of goods and passengers carried by air grew much faster than in the rest of the world between 1996 and 2005, doubling in Asia and quadrupling in East Asia. However, airport infrastructure in Central and West Asia, Southeast Asia, and the Pacific lags behind East Asia.

Road coverage varies, improving in some countries while declining in others. Although paved-road coverage has improved in East and Southeast Asia, it has fallen in Central and West Asia, mainly due to poor maintenance and insufficient funding for upgrading existing road networks (Ziyadov 2008, World Bank 2008b).

The quality of the road network in East and Southeast Asia remains much lower than in Organisation for Economic Co-operation and Development (OECD) countries. Only 2% of the PRC's highway network is expressways. Asia has a much lower road density per land area than the OECD average and significantly fewer roads per person (perhaps partly reflecting its higher population density), as Figure 2.1 shows.

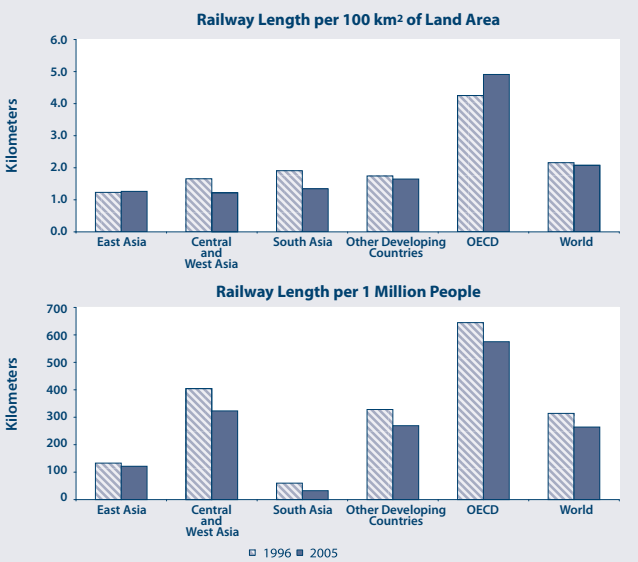
Figure 2.1. Road Network Indicators by Region, 1996 and 2005



km^2 = square kilometer; OECD = Organisation for Economic Co-operation and Development.
Notes: East Asia (15) includes: Brunei Darussalam; Cambodia; Hong Kong, China; Indonesia; Lao People's Democratic Republic; Malaysia; Mongolia; Myanmar; People's Republic of China; Philippines; Republic of Korea; Singapore; Taipei,China; Thailand; and Viet Nam. Central and West Asia (8) includes: Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan. South Asia (8) includes: Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka. Other developing countries include 116 countries classified as developing by the International Monetary Fund.
Source: World Bank (2007a, 2008b, 2009b).

Railways constitute another weak link. Except in East Asia, Asia's rail network actually shrank between 1996 and 2005, as few new rail routes were created, while existing ones were not maintained. The region's rail network totaled 182,000 km in 2005, around two fifths of OECD's 472,000 km. The gap is even bigger when comparing rail lines per land area and per person (Figure 2.2). Worldwide, the volume of goods transported by rail increased between 1996 and 2005, with Asia recording an increase of around 50%. The PRC's railway network, which accounts for 6% of the global total, struggles to move a quarter of the world's rail freight.

Figure 2.2. Railway Indicators by Region, 1996 and 2005

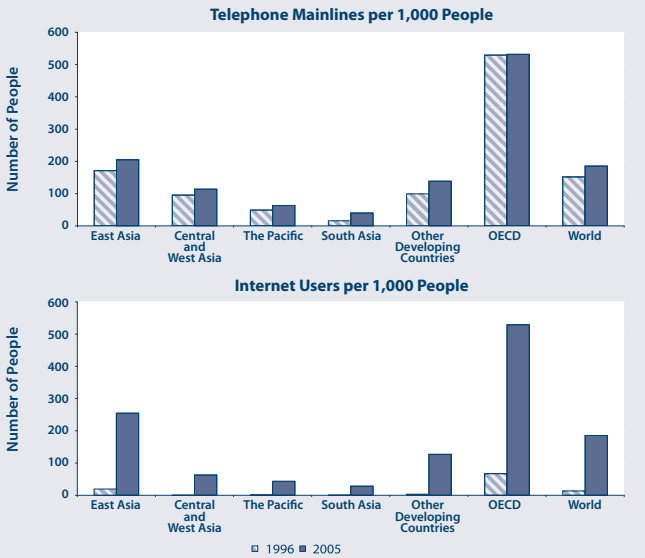


km^2 = square kilometer; OECD = Organisation for Economic Co-operation and Development.
Notes: East Asia (15) includes: Brunei Darussalam; Cambodia; Hong Kong, China; Indonesia; Lao People's Democratic Republic; Malaysia; Mongolia; Myanmar; People's Republic of China; Philippines; Republic of Korea; Singapore; Taipei,China; Thailand; and Viet Nam. Central and West Asia (8) includes: Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan. South Asia (8) includes: Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka. Other developing countries include 116 countries classified as developing by the International Monetary Fund.
Source: World Bank (2007a).

Communication

Some 1.2 billion Asians subscribed to a telephone service in 2005, almost nine times as many as in 1996. Despite this dramatic increase, the region still lags behind OECD levels. East Asia has the highest telephone density in Asia, while South Asia has the lowest. Except for East Asia, all Asian subregions have a lower telephone density than in other developing countries (Figure 2.3). The number of internet users per 1,000 people has risen dramatically all over the world, increasing 14 times between 1996 and 2005. In Asia, the number increased more than 18 times, compared with 8 times in OECD countries. However, the majority of Asians still have only limited access to the internet.

Figure 2.3. ICT Indicators by Region, 1996 and 2005



ICT = information and communication technology; OECD = Organisation for Economic Co-operation and Development.

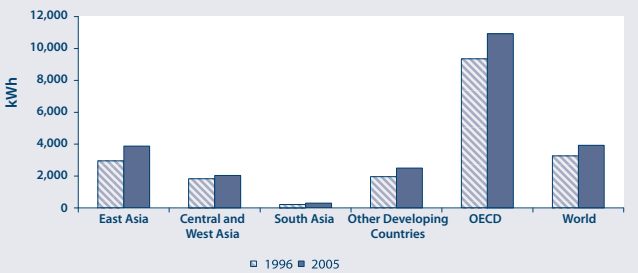
Notes: East Asia (15) includes: Brunei Darussalam; Cambodia; Hong Kong, China; Indonesia; Lao People's Democratic Republic; Malaysia; Mongolia; Myanmar; People's Republic of China; Philippines; Republic of Korea; Singapore; Taipei,China; Thailand; and Viet Nam. Central and West Asia (8) includes: Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan. The Pacific includes: Cook Islands, Democratic Republic of Timor-Leste, Federated States of Micronesia, Fiji Islands, Kiribati, Marshall Islands, Nauru, Papua New Guinea, Republic of Palau, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu. South Asia (8) includes: Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka. Other developing countries include 116 countries classified as developing by the International Monetary Fund.

Source: World Bank (2007a, 2008b).

Energy

Asia produced 24% of the world's electricity in 2004, up from 17% in 1996, with most of the increase coming in East Asia. The PRC alone generates more than half of the region's total electricity. Asia (excluding the Pacific due to lack of data) produced 4,057 billion kilowatt-hours (kWh) of electricity in 2005 and consumed 3,630 billion kWh. Although Asia's electricity consumption increased significantly between 1996 and 2005, it remained well below OECD levels (Figure 2.4). Electricity consumption varies widely across the region. Hong Kong, China; Republic of Korea; and Singapore consume more than 5,000 kWh per person, while Bangladesh, India, Indonesia, Myanmar, Nepal, Pakistan, and Sri Lanka consume less than 500 kWh per person. Furthermore, Asia is projected to increase its energy consumption by more than 3% per annum over the next 10 years—1% higher than the world's energy consumption rate.

Figure 2.4. Electricity Consumption Per Capita, kWh, 1996 and 2005



kWh = kilowatt-hour; OECD = Organisation for Economic Co-operation and Development.
Notes: East Asia (15) includes: Brunei Darussalam; Cambodia; Hong Kong, China; Indonesia; Lao People's Democratic Republic; Malaysia; Mongolia; Myanmar; People's Republic of China; Philippines; Republic of Korea; Singapore; Taipei,China; Thailand; and Viet Nam. Central and West Asia (8) includes: Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan. South Asia (8) includes: Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka. Other developing countries include 116 countries classified as developing by the International Monetary Fund.
Source: World Bank (2007a, 2008b).

Detailed figures on Asia's primary energy consumption are presented in Table A2.4 in the Appendix.

Infrastructure Quality

Cross-country comparisons of infrastructure quality are bedeviled by measurement problems, statistical gaps, and the inherently subjective nature of such assessments. Table 2.1 presents one such assessment[12] from the World Economic Forum's (WEF) Global Competitiveness Report 2008–2009. The measurement is based on a survey of global business leaders' perceptions[13] and available data indicators[14] (WEF 2008). It concludes that the quality of Asia's infrastructure lags behind the world average, except in the case of railroads. Among subregions, East Asia is ranked highest and South Asia lowest. In 12 of the 22 Asian economies surveyed, the quality of infrastructure is deemed to be below the world average. There is a strong positive correlation[15] between the WEF's gauge of perceived infrastructure quality and its global competitiveness index,[16] data on which are provided in Table A2.3 in the Appendix.

To sum up, Asia has made big improvements in its infrastructure, but there is still much more to do to bring its quantity and quality up to scratch.

12 Qualitative assessments are based on the computed country score calculated by calibrating results of the survey with available hard (quantity) assessments. Detailed information can be found in Chapter 2.1 of The Global Competitiveness Report 2008–2009 by the World Economic Forum (WEF).

13 The Executive Opinion Survey is an annual survey conducted by the WEF that was completed by 12,297 top management business leaders in 134 countries.

14 Hard data include the infrastructure indicators on roads, railroads, ports, air transport, and electricity supply available from various international sources such as the International Air Transport Association, International Telecommunications Union, etc.

15 Correlation coefficient is 0.968 based on the pooled data of 2006, 2007, and 2008.

16 Competitiveness is defined as the set of institutions, policies, and other factors that determine a country's level of productivity. It is based on a weighted average of 12 pillars of economic competitiveness, namely institutions, infrastructure, macroeconomic stability, health and primary education, higher education and training, goods and market efficiency, financial market integration, financial market sophistication, technological readiness, market size, business sophistication, and innovation (WEF 2008).

Table 2.1. Comparison of Asian Infrastructure Quality with the World, 2008

Region/Country	Overall Infrastructure	Road	Railroad	Port	Air Transport	Electricity Supply
World average	3.8	3.8	3.0	4.0	4.7	4.6
G7 countries average	5.7	5.7	5.4	5.4	5.8	6.4
Asia Average	**3.8**	**3.7**	**3.6**	**3.9**	**4.6**	**4.1**
Central Asia Average	**3.5**	**3.1**	**3.6**	**3.2**	**4.2**	**3.6**
Azerbaijan	3.9	3.7	4.0	4.2	5.2	3.9
Georgia	3.2	3.5	3.5	3.9	4.2	4.4
Kazakhstan	3.5	2.5	3.6	3.2	3.7	4.3
Tajikistan	3.2	2.6	3.3	1.6	3.5	1.7
East Asia Average	**4.6**	**4.7**	**4.8**	**4.8**	**5.1**	**5.3**
China, People's Rep. of	3.9	4.1	4.1	4.3	4.4	4.7
Hong Kong, China	6.3	6.4	6.2	6.6	6.7	6.7
Korea, Rep. of	5.6	5.8	5.8	5.2	5.9	6.2
Mongolia	1.7	1.4	2.1	2.4	2.7	2.9
Taipei,China	5.5	5.6	5.7	5.5	5.7	5.9
South Asia Average	**2.9**	**3.1**	**2.8**	**3.4**	**4.2**	**2.8**
Bangladesh	2.2	2.8	2.3	2.6	3.4	1.9
India	2.9	2.9	4.4	3.3	4.7	3.2
Nepal	1.9	1.9	1.3	2.9	3.5	1.7
Pakistan	3.1	3.5	3.0	3.7	4.2	2.5
Southeast Asia Average	**4.2**	**4.2**	**3.2**	**4.3**	**5.1**	**4.7**
Brunei Darussalam	4.7	5.1	–	5.0	5.6	5.4
Cambodia	3.1	3.1	1.6	3.4	4.2	2.5
Indonesia	2.8	2.5	2.8	3.0	4.4	3.9
Malaysia	5.6	5.7	5.0	5.7	6.0	5.8
Philippines	2.9	2.8	1.8	3.2	4.1	4.2
Singapore	6.7	6.6	5.6	6.8	6.9	6.7
Thailand	4.8	5.0	3.1	4.4	5.8	5.5
Viet Nam	2.7	2.6	2.4	2.8	3.9	3.2

– data not available.
Notes: Group of Seven (G7) countries include: Canada, France, Germany, Italy, Japan, United Kingdom, and United States. Score: 1 = underdeveloped, 7 = extensive and efficient by international standards.
Source: World Economic Forum (2008).

2.2. Trends in Asian Trade

Supported by improvements in trade-related infrastructure, Asia's trade has soared over the past two decades, with East Asia and the PRC in particular recording explosive growth (Table 2.2). The PRC's exports grew at an average of over 20% a year between 1987 and 2007, while the other eight emerging economies among Asia's top ten exporters notched up export growth of over 10% a year. The PRC's imports increased by over 18% a year, while seven of the other eight emerging economies in the table also recorded double-digit growth rates. In just 20 years, India's trade expanded 17 times, while the PRC's increased over 30 times. The PRC became the largest trader in Asia, far surpassing Japan. But while Asia's poorer economies send less than 10% of their exports to the PRC, Asia's richer ones send a much larger share: more than 15% in Japan, 22% in the Republic of Korea, over a third in Taipei,China, and almost half in Hong Kong, China.

Table 2.2. Trade Growth in Asia's 10 Leading Exporters, 1987–2007

Economy	Exports			Imports			Exports to PRC	Annual Growth in Exports to (%)	
	$ Billion, 2000 Constant Prices		Average Growth Rate (%)	$ Billion, 2000 Constant Prices		Average Growth Rate (%)	(% of Total Exports)	PRC	Rest of World
	1987	2007	1987–2007	1987	2007	1987–2007	2007	1987–2007	1987–2007
China, People's Rep. of	33.3	1464.0	20.8	37.2	1109.7	18.5	–	–	20.8
Japan	297.4	739.9	4.7	172.8	898.6	8.6	15.3	12.5	4.0
Hong Kong, China	40.9	420.0	12.3	41.7	429.6	12.4	48.3	16.5	10.2
Taipei,China	83.3	361.1	10.3	79.9	262.3	8.3	33.6	22.8	7.8
Korea, Rep. of	51.6	289.5	10.1	27.9	421.6	16.3	22.1	25.3	8.7
Singapore	35.2	272.8	10.8	30.4	283.9	11.8	9.7	18.4	10.4
Malaysia	15.1	211.8	14.1	10.9	170.5	14.7	8.8	24.4	13.7
Thailand	9.8	184.6	15.8	11.2	166.9	14.5	9.7	22.1	15.4
India	10.2	175.4	15.3	14.8	253.8	15.3	6.5	40.7	14.9
Indonesia	14.5	137.2	11.9	10.6	86.4	11.0	8.5	20.3	11.5

$ = United States dollar; PRC = People's Republic of China.
– data not available.
Note: First year data for Republic of Korea from 1989, and for Taipei,China from 1992.
Source: United Nations Commodity Trade Statistics Database.

Developing Asia now accounts for a much larger share of world trade, up from 13.8% in 1990 to 24.0% in 2007. Despite Japan's share of world trade having fallen, Asia's share of world trade rose from 22.7% in 1990 to 29.2% in 2007. East Asia accounts for the lion's share of Asia's trade. Excluding Japan, East Asia's share of world trade soared by 9.2 percentage points between 1990 and 2007, from 13.0% to 22.2%, with the PRC's share more than quadrupling from 1.9% to 8.8%.[17] Trade within non-Japan East Asia grew faster (15.2% a year) than the region's external trade (10.6%). Trade within non-Japan East Asia now accounts for 11% of world trade, up from 4.2%, while its external trade accounts for 11.3%, up from 8.7% (see Table 2.3).[18]

Including Japan, the 5.5 percentage-point growth of the share of East Asian exports in world trade (from 21.9% in 1990 to 27.4% in 2007) came mostly from trade within East Asia (which rose by 4.6 percentage points from 8.8% of world trade in 1990 to 13.4% in 2007). Trade with the PRC accounted for over half (2.6 percentage points) of that increase. East Asia's trade with the PRC now accounts for 3.7% of world exports. Whereas the PRC accounted for 8.8% of East Asian exports in 1990, it accounted for 32.1% in 2007.

Intraregional trade accounts for a growing share of most regions' trade—half of world trade takes place between partners less than 3,000 km apart (Berthelon and Freund 2004)—and this regional trend is particularly noticeable in East Asia (see Table 2.3).[19] Trade within East Asia accounted for 49.4% of its exports in 2007, and grew faster (12.5% a year) between 1990 and 2007 than the region's trade with the rest of the world (8.9%). Trade within East Asia also grew far faster than trade among North American Free Trade Agreement (NAFTA)

17 East Asia comprises 16 economies: Brunei; Cambodia; PRC; Hong Kong, China; Indonesia; Republic of Korea; Lao PDR; Malaysia; Mongolia; Myanmar; Philippines; Singapore; Taipei,China; Thailand; Viet Nam; and Japan.

18 Calculated from United Nations Commodity Trade Statistics Database (S2, items-total).

19 The elasticity of trade with respect to distance has been shown to be in the range of -0.9 to -1.5, indicating that trade over an 8,000 km distance tends to be 90% less than over a 1,000 km distance, other things being equal (Venables 2006).

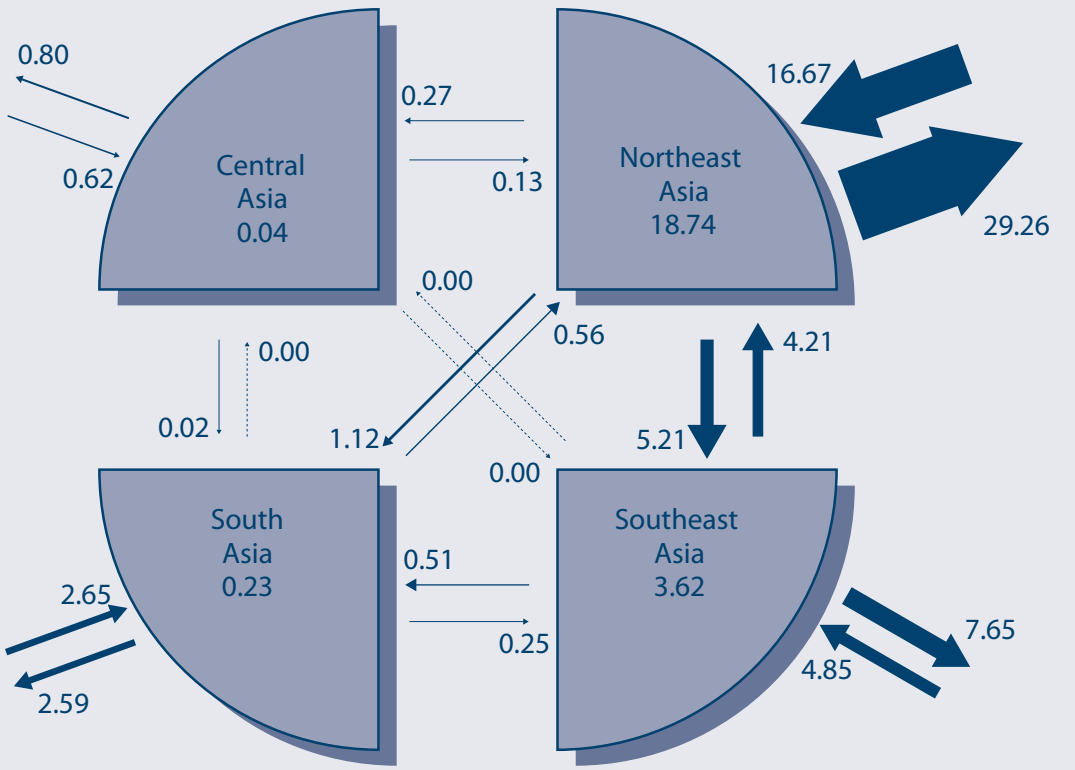
Table 2.3. Trade in Asian Subregions and Other World Regions, 1990–2007

	Total Exports ($ billion)					Share of	
	1990	1995	2000	2005	2007	1990	1995
East Asia (15)	417.8	870.4	1,193.9	2,136.6	3,075.3	13.0	17.9
Intraregional	136.1	344.7	456.4	901.7	1517.7	4.2	7.1
Extraregional	281.7	525.7	737.5	1,234.9	1,557.6	8.7	10.8
East Asia (16)	704.7	1313.3	1,673.1	2,731.5	3,789.5	21.9	27.1
Intraregional	284.0	646.2	797.8	1,389.5	1,853.4	8.8	13.3
Extraregional	420.7	667.1	875.3	1,342.0	1,936.1	13.0	13.7
Central and West Asia	–	5.6	14.9	34.7	62.2	–	0.2
Intraregional	–	1.9	1.2	2.9	3.9	–	0.1
Extraregional	–	3.7	13.7	31.8	58.3	–	0.1
South Asia	27.2	43.7	60.7	125.8	194.4	0.8	0.9
Intraregional	0.9	2.1	2.9	8.4	12.1	0.0	0.0
Extraregional	26.3	41.6	57.8	117.4	182.3	0.8	0.9
EU	1,521.6	2,010.8	2,424.3	4,054.3	5,316.8	47.2	41.4
Intraregional	1,018.6	1,401.3	1,641.5	2,732.1	3,601.1	31.6	28.9
Extraregional	503.0	609.5	782.8	1,322.2	1,715.7	15.6	12.6
NAFTA	546.1	853.6	1,223.6	1,478.7	1,834.6	16.9	17.6
Intraregional	225.8	392.9	681.6	824.4	930.8	7.0	8.1
Extraregional	320.4	460.7	542.1	654.3	903.8	9.9	9.5
MERCOSUR	64.6	89.1	122.5	219.4	324.3	2.0	1.8
Intraregional	4.9	16.8	20.0	24.2	38.5	0.2	0.3
Extraregional	59.7	72.3	102.5	195.2	285.8	1.9	1.5
World Exports	3,224.8	4,853.9	6,233.1	9,859.0	13,830.0	100.0	100.0
Japan	286.9	442.9	479.2	594.9	714.2	8.9	9.1
PRC	62.1	148.8	249.2	762.0	1218.1	1.9	3.1
United States	392.9	583.0	780.3	904.3	1162.2	12.2	12.0
East Asia(16) to PRC	34.4	110.1	151.0	383.1	509.8	1.1	2.3

$ = US dollar; EU = European Union; MERCOSUR = Mercado Común del Sur; PRC = People's Republic of China; NAFTA = North American Free Trade Agreement; US = United States.
– data not available.
Notes:
1. East Asia (15) includes: Brunei Darussalam; Cambodia; Hong Kong, China; Indonesia; Lao People's Democratic Republic; Malaysia; Mongolia; Myanmar; PRC; Philippines; Republic of Korea; Singapore, Taipei,China; Thailand; and Viet Nam.
2. East Asia (16) includes: East Asia (15) plus Japan.
3. Central and West Asia (8) includes: Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan.
4. South Asia (7) includes: Afghanistan, Bangladesh, India, Maldives, Nepal, Pakistan, and Sri Lanka.
5. EU includes its 27 members: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and United Kingdom.
6. MERCOSUR includes its 4 members and 1 prospective member: Argentina, Brazil, Paraguay, Uruguay, and Venezuela.
7. NAFTA includes its 3 members: Canada, Mexico, and the US.
8. Japan, PRC, and US share of intraregional exports in total is only intraregional exports (share of individual country's export to the region in total region exports).
9. Annual growth of Central and West Asia is for 1995–2005.
Source: Calculated from United Nations Commodity Trade Statistics Database (S2, items-total) and International Monetary Fund Direction of Trade Statistics 2008.

World Trade (%)			Share of Intraregional Exports in Total (%)					Annual Growth (%)
2000	2005	2007	1990	1995	2000	2005	2007	1990–2007
19.2	21.7	22.2	100.0	100.0	100.0	100.0	100.0	12.5
7.3	9.1	11.0	32.6	39.6	38.2	42.2	49.4	15.2
11.8	12.5	11.3	67.4	60.4	61.8	57.8	50.6	10.6
26.8	27.7	27.4	100.0	100.0	100.0	100.0	100.0	10.4
12.8	14.1	13.4	40.3	49.2	47.7	50.9	48.9	11.7
14.0	13.6	14.0	59.7	50.8	52.3	49.1	51.1	9.4
0.3	0.6	0.4	–	100.0	100.0	100.0	100.0	22.2
0.0	0.0	0.0	–	33.4	8.1	8.4	6.3	6.4
0.3	0.5	0.4	–	66.6	91.9	91.6	93.7	25.7
1.0	1.3	1.4	100.0	100.0	100.0	100.0	100.0	12.3
0.0	0.1	0.1	3.5	4.7	4.8	6.7	6.2	16.2
0.9	1.2	1.3	96.5	95.3	95.2	93.3	93.8	12.1
38.9	41.1	38.4	100.0	100.0	100.0	100.0	100.0	7.6
26.3	27.7	26.0	65.9	62.1	61.1	59.7	67.7	7.7
12.6	13.4	12.4	34.1	37.9	38.9	40.3	32.3	7.5
19.6	15.0	13.3	100.0	100.0	100.0	100.0	100.0	7.4
10.9	8.4	6.7	41.3	46.0	55.7	55.8	50.7	8.7
8.7	6.6	6.5	58.7	54.0	44.3	44.2	49.3	6.3
2.0	2.2	2.3	100.0	100.0	100.0	100.0	100.0	10.0
0.3	0.2	0.3	8.9	20.5	20.9	13.1	11.9	12.9
1.6	2.0	2.1	91.1	79.5	79.1	86.9	88.1	9.6
100.0	100.0	100.0	–	–	–	–	–	8.9
7.7	6.0	5.2	12.2	14.4	11.7	10.4	8.8	5.0
4.0	7.7	8.8	5.8	6.2	6.9	11.0	12.2	18.2
12.5	9.2	8.4	14.8	13.1	11.4	7.7	7.1	5.7
2.4	3.9	3.7	12.1	17.0	18.9	27.6	27.5	17.2

Figure 2.5. Intraregional Trade Flows in Asia, 2007 (as a percentage of Asia's total trade)



ASEAN = Association of Southeast Asian Nations; SAARC = South Asian Association for Regional Cooperation.
Notes: Central Asia includes: Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan. Northeast Asia includes: Hong Kong, China; Japan; Mongolia; People's Republic of China; Republic of Korea; and Taipei,China. Southeast Asia includes: Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Viet Nam (ASEAN). South Asia includes: Afghanistan, Bangladesh, India, Maldives, Nepal, Pakistan, and Sri Lanka (SAARC excluding Bhutan).
Sources: International Monetary Fund Direction of Trade Statistics, December 2008; United Nations Commodity Trade Statistics 2006 for Taipei,China.

(7.4%) and EU-27[20] members (7.6%). But trade among and within other Asian subregions is still relatively small (Figure 2.5).

[20] European Union (EU)-27 includes: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and the United Kingdom.

Developing Asia's imports from within the region have risen far faster than exports within the region. In 2005–2006, intraregional imports amounted to 58.6% of total imports, up from 41.5% in 1992–1993. The intraregional share in total regional exports was significantly lower, however, at 37.7% in 1992–1993 and 40.0% in 2005–2006 (Athukorala 2008). These figures underscore the continued importance to Asia of exports to the rest of the world—and of the infrastructure and logistics to facilitate them.

In all East Asian countries, the share of components in exports and imports within the region has increased much faster than in trade with the rest of the world (Athukorala 2008). In 2005–2006, exports within the region accounted for 60% of total component exports; for component imports, the share was even higher. The increase in component intensity has been particularly noticeable in Southeast Asia's trade with the other developing East Asian economies, notably the PRC. The Republic of Korea and Taipei,China are also involved in substantial component trade with other countries in the region.

In addition to Asia's trading pattern, the shape of its trade is also changing—and with it the region's infrastructure needs. Asia's trade is becoming lighter. The content of Asia's trade is shifting from bulky goods towards lighter, often higher value goods and weightless services. In particular, the information and communication technology (ICT) revolution has generated increased trade in ICT products and outsourced services, as well as greater migration of highly skilled professionals. More generally, the weight-to-value ratio of Asia's trade in goods is declining. This has important implications for the choice of transport mode, the distance and destination of trade flows, the location and fragmentation of production processes, and the demand for supporting infrastructure (Hummels 2009).

Changes in transport technology, notably improvements in air freight and containerization, have amplified these trends. Air cargo involving Asian countries has grown much faster than in the world as a whole, with international flights within Asia experiencing rapid growth. Multimodal shipping and improvements in logistics services

have made it possible to trade with more places in less time and often at lower cost (Brooks and Hummels 2009).

In Asia, only 1–5% of trade by value is among countries with a shared land border.[21] Nearly all goods traded with non-adjacent partners move by air or sea. When infrastructure improvements lower the marginal cost of trade, exports tend to expand in two ways: new products are exported to new destinations, typically through small shipments from small firms, and existing trade flows deepen. When the new markets are inland, air transport may be a viable alternative to a combination of sea and land freight to avoid or reduce potential port congestion, and to save time.

Air has the huge advantage of speed—and advances in technology have made air transportation much cheaper in recent years. The cost of air freight fell by 90% between 1955 and 2004 (Hummels 2009).[22] This makes long-distance trade more attractive and expands the range of potential export markets. The falling weight-to-value ratio of traded goods and the declining share of trade costs in delivered goods prices reinforce this pattern. In effect, economic distance is shrinking: trading with far-off markets is no longer much more expensive than trading with neighboring ones. Because the marginal cost of sending air cargo an additional mile is falling rapidly, the average air shipment is traveling for a longer distance while the average ocean shipment is going a shorter distance (Hummels 2007).

Another factor driving the rise in air freight is that, as consumers in rich countries get richer, their demand for higher quality imports rises. This affects demand for air transport in three ways: First, higher quality goods tend to be more expensive, so transport costs are a smaller share of the delivered price. Second, as consumers grow richer, so does their willingness to pay for particular product characteristics; producers therefore have an incentive to manufacture to specification, and to adjust production and shipments quickly and flexibly. Third, delivery speed is itself an important aspect of product quality for many

21 By comparison, around a quarter of world trade is between countries sharing a common border (Berthelon and Freund 2004).

22 As measured by average revenue per ton-kilometer.

consumers, and the demand for timely delivery is rising as incomes grow (Hummels 2009).

The combination of increased trade in parts and components within Asia and greater long-distance air shipments is generating many more (mostly small) new shipments, while the biggest existing shipments are getting even bigger. Thus, in the case of the PRC's exports, the mean shipment is getting bigger, while the median is falling. The pattern in other Asian countries is similar (in some cases, both mean and median are falling, but medians are falling faster [Hummels 2009]).

In short, Asia's trade expanded rapidly (until the current crisis). Trade within East Asia has risen particularly fast. Asia's trade is becoming lighter and more valuable, and is increasingly shipped by air.

2.3. Infrastructure for Trade and Investment

Given the importance of transportation, ICT, and trade facilitation measures in Asia's trade and investment, this section briefly examines ways and means to develop trade and investment-related infrastructure and the associated challenges.

Trade Costs

Trade costs, in broad terms, include all costs incurred in getting goods from the production place to the final users or consumers rather than the cost of producing the goods themselves. For example, these costs include transportation costs (both freight and time), policy barriers (tariff and nontariff), transit delays, information costs, contract enforcement costs, costs associated with the use of different currencies, legal and regulatory costs, and local wholesale and retail distribution costs (Anderson and van Wincoop 2004).

Trade costs can account for a large share of the prices of delivered goods and thus influence demand. The quantity of infrastructure

investment, the quality of infrastructure services, and the efficient coordination of logistics services that lower trade costs influence trade performance in a variety of ways. Nordas and Piermartini (2004) highlighted four factors:

- **Direct monetary outlays** on communications, business travel, freight, insurance, and logistics services are affected by the quality of infrastructure and the cost and quality of related services.
- **Timeliness** is even more likely to be influenced by geography and infrastructure.
- **Risk** of damaged cargo, and so of higher losses and insurance costs, are greater when infrastructure is poor.
- **Lack of access** to transport or telecommunications services can have a high opportunity cost, limiting market access and trading opportunities.

The relative importance of different categories of infrastructure-related trade costs can be surprising. For example, in 2005, the ocean freight rate for importing a container to India was around two thirds greater than for exporting, while the rate for importing a container to the PRC from six Asian countries was far lower than for exporting (De 2009a). Auxiliary shipping charges (such as documentation fees, container-handling charges, and government taxes and levies) may account for much of this difference; these are sometimes greater than ocean freight charges, particularly where shipments experience congestion at ports or borders. On average, auxiliary shipping charges outweigh terminal handling charges across countries and commodities in Asia, and their variations contribute significantly to variations in trade costs. Improvement in logistics services, including better cross-country coordination, could help to lower both their average cost and their variability. This is one important area where regional cooperation in strengthening soft infrastructure could help lower trade costs.

The composition of freight charges also varies significantly across countries and commodity categories. In some cases, inland freight charges are a smaller share of total freight charges than the charges for ocean freight. Often, however, they are greater (De 2009a). Thus, countries for which inland freight is particularly expensive need

to focus their infrastructure efforts on improving inland services. Looking at different commodity groups, the weight-to-value ratio is the main determinant of transport costs, suggesting that the preferred means of transporting heavier cargoes is by sea, followed by rail and then by road.[23] Landlocked countries and inland regions that export heavy goods should therefore consider prioritizing the development of streamlined rail connections to efficient ports. Rail has the added benefit of being a less carbon-intensive transport mode and hence more environmentally friendly than are roads.

Infrastructure and logistics need to adjust to the impact of changes in oil prices on trade. The high rise in oil prices in the first half of 2008 reached a record $142.99 per barrel in July (Powell and Clark 2009), raising shipping (and therefore import) costs, shifting the balance in favor of domestic (or nearby) producers. Such changes can have a double impact on products in international supply chains, since the prices of both imported inputs and exported final products rise. For example, PRC steel produced with Brazilian iron ore for export to the US would be hit twice by higher fuel charges (three times if including the cost of energy used in production). The impact of an increase in oil price is greater where the goods (or their imported components) are shipped by air or have a high weight-to-value ratio, and where fuel accounts for a higher share of freight costs. Decreases in oil prices and improvements in transport technology, on the other hand, would most likely have the opposite effect.

Time is also an important factor, particularly for perishable or other time-sensitive goods. Hummels (2001) found that the time cost of one day in transit for US imports is equivalent to an ad valorem tariff rate of 0.8%, implying the equivalent of a 16% tariff on an average trans-Pacific shipment of 20 days. Clearly, improvements in infrastructure services that reduce delays at borders, in transit, or in ports will increase a country's propensity to trade. Encouragingly, the

[23] Hummels and Skiba (2004) found that a 10% increase in the ratio of product weight to value results in a 4% increase in ad valorem shipping costs. Hummels (2007) noted that during 1960–2004 the real value of manufacturing trade grew around 1.5% a year faster than the weight of nonbulk cargoes. Including bulk commodities, the real value of all trade grew 1.8% a year faster than its weight, thus showing a relative decrease in the weight-to-volume ratio.

January 2008 maiden run of the Beijing–Hamburg container express rail service covered its 10,000 km journey in 15 days, compared with around 30 days for the comparable journey by sea (UNCTAD 2008).

The impact of trade costs and timeliness is particularly important in the case of inland areas and landlocked countries, as the next section discusses.

Access to Markets

As land and labor costs rise in Asia's coastal regions, investors are looking to locate production facilities further inland. However, they are hampered by inadequate infrastructure connections, which raise transport costs to and from those areas. In the PRC, this realization has led to a shift in infrastructure policy to give greater weight to hinterland access. Railways, which are particularly suited to transporting bulk commodities, which constitute the greater share of production in inland provinces, have been prioritized. The shifting focus to inland regions magnifies the importance of seamless intermodal connections.

Improved infrastructure is vital for connecting remote areas and landlocked countries with regional and global markets. The median landlocked country has 55% higher transport costs than the median coastal one.[24] Transporting goods over land is around seven times more costly than over a similar distance by sea, and estimates of the elasticity of trade flows with respect to transport costs range from -2 to -3.5, suggesting that lowering a landlocked country's trade costs by 10% through regional infrastructure development could increase its exports by over 20% (Venables 2006).

The 12 landlocked countries[25] in Asia—Afghanistan, Armenia, Azerbaijan, Bhutan, Kazakhstan, Kyrgyz Republic, Lao PDR, Mongolia, Nepal, Tajikistan, Turkmenistan, and Uzbekistan—are especially

[24] Limao and Venables (2001) found that domestic infrastructure explains around 40% of transport costs for coastal countries, while domestic and transit-country infrastructure together account for an estimated 60% of transport costs for landlocked countries.

[25] Landlocked countries are those that do not have access to an open sea. Some landlocked countries, such as Azerbaijan, have access to an inland sea, such as the Caspian.

disadvantaged. Most are 700–1,000 km from the nearest port; four (Kazakhstan, Kyrgyz Republic, Tajikistan, and Uzbekistan) are over 3,000 km from the sea (UNESCAP 2007b). They struggle with poor physical infrastructure, small domestic markets that are remote from world markets, and high vulnerability to external shocks. Unless they are transported expensively by air, traded goods must transit through at least one neighboring state, and frequent changes in transport mode result in high transaction costs. Customs and transport inefficiencies hamper access to global markets, deter FDI, and raise the cost of imports. UNCTAD (2008) suggested that a multidimensional approach is needed to tackle these problems. This involves developing adequate national transport networks and efficient transit systems, promoting regional or subregional economic integration, and encouraging FDI in economic activities that are not distance sensitive. For example, in 1995, the United Nations General Assembly endorsed the Global Framework for Transit Transport Cooperation between Land-locked and Transit Developing Countries and the Donor Community with a view to enhancing transit systems and enabling landlocked and developing countries to reduce their marginalization from world markets.

Many other Asian countries have vast remote areas with poor connections to other domestic markets, as well as to international sea and air gateways. Low population density and geographic remoteness are exacerbated by inadequate transport infrastructure. Where markets are distant and trade volumes low, justifying the building and maintaining of even basic infrastructure is difficult. This creates a vicious circle.

In small and less-developed countries such as Bangladesh, Cambodia, Lao PDR, and Mongolia, roads are often closed; transport services may be suspended; and poor infrastructure requires the use of small, inefficient vehicles and vessels that have high operating costs. Transport systems are poorly integrated and lack streamlined procedures to support the seamless movement of containers between coastal and inland areas. Border procedures are often cumbersome and time consuming. Pacific island countries face particular challenges in transport, since shipping distances are large, and shipments are generally small and of relatively low value added.

Inland transport is particularly slow and expensive in South Asia. It accounts for around 88% of total trade transport costs in the subregion (De 2009b). Land border crossings are overcrowded, and greater policy attention to efficiency concerns could easily reduce delays and monetary costs. Complex border-crossing requirements expand possibilities for corruption and encourage informal trade. Unsurprisingly, trade within South Asia is low. There is therefore a strong case for subregional cooperation to improve soft infrastructure and inland transport so as to raise exporters' competitiveness.

To sum up, large and landlocked countries probably need to put more emphasis on rail and road infrastructure in order to get goods to ports more cheaply. For Asia's many landlocked countries, regional cooperation agreements on transit facilitation are particularly important.

Trade Facilitation and Soft Infrastructure

Bottlenecks at Asia's borders often impede the efficiency of its logistics systems. Trade facilitation—streamlining the movement of goods and services across borders—is therefore vital. Physical facilities need to be improved so that shipments can move smoothly and quickly. Customs procedures also need to be simplified and harmonized so that exports do not incur costly delays. Complying with export requirements can take around a month in many Asian countries compared with only 11 days in the OECD (Table 2.4). The pattern is similar for importing, although the time and cost involved are slightly greater. Streamlining these procedures and costs should clearly be a priority.

At the same time, reducing bureaucracy and improving port efficiency should also be a priority for boosting Asia's trade, since the vast bulk of it goes by sea. This is vital not just for nearby coastal regions, but also for inland areas and landlocked countries whose trade is channeled through road and rail links to ports. Infrastructure improvements that raise port efficiency can reduce shipping costs[26].

[26] Clark et al. (2004) found that infrastructure improvements that raise port efficiency from the bottom 25% to the top 25% can reduce shipping costs by more than 10%.

Table 2.4. Border Trade Costs, 2009

Subregion	Sub-Saharan Africa	East Asia and Pacific	South Asia	Central and West Asia	Latin America and Caribbean	OECD
Exports						
Documents needed (average number)	8	7	9	7	7	5
Time required (days)	34.7	23.3	33	29.7	19.7	10.7
Cost to ($ per container)	1,878.8	902.3	1,339.1	1,649.1	1,229.8	1,069.1
Imports						
Documents needed (average number)	9	7	9	8	7	5
Time required (days)	41.1	24.5	32.5	31.7	22.3	11.4
Cost to ($ per container)	2,278.7	948.5	1,487.3	1,822.2	1,384.3	1,132.7

$ = United States dollar; OECD = Organisation for Economic Co-operation and Development.
Source: World Bank (2009a).

Congestion has been a growing problem. In the case of the PRC, Ma and Zhang (2009) found that ports were congested due to the long neglect of access routes and port facilities. In Shanghai, inefficiencies from overloading the physical infrastructure are compounded by a lack of collaboration among stakeholders. Trade facilitation and administrative procedures at customs are unreliable, and the customs transit system needs to be rationalized to reduce inspection times and simplify declarations and the documentation process. Shanghai's congestion is reducing its competitiveness in the region, endangering its status as a hub and gateway to international markets and suppliers. Consequently, in recent years, the number of transshipped containers from Shanghai via Hong Kong, China has accounted for as much as 20% of Shanghai's total container throughput.

With berth space in ports now a constraint on Asia's trade expansion, exploiting complementarities with other modes of transport is a particularly urgent priority. Ports can move more goods, particularly in containers, when served by efficient rail, road, and inland waterway networks; ICT infrastructure; storage yards; and trained human resources.

Increasing port efficiency enables countries to reap large economies of scale. Accommodating larger, faster ships and expanding container facilities reduces the average time shipments spend at sea and in ports. Service tends to become more frequent, facilitating timely delivery. A densely traded route also enables an effective use of hub and spoke arrangements, in which small container vessels feed shipments into a hub where containers are aggregated into much larger and faster container ships for longer hauls.

Trade growth along a particular shipping route also encourages entry—and where permitted, new competition tends to drive down shipping margins, particularly when complemented by an effective competition policy that constrains monopoly power and removes barriers to entry (Brooks 2005). Hummels et al. (2007) found that ocean liners charge much higher freight rates for goods whose import demand is relatively inelastic, indicating that shipping firms are most likely exercising market power. In 2006, one in six importer-exporter pairs was served by a single liner service; over half were served by three or fewer.

A study of several Asian ports found that specific infrastructure investments significantly reduce port costs (Haveman et al. 2009). A new harbor, wharf, or terminal is estimated to decrease average port costs by 2%, while a new crane reduces port costs by 1%. Perhaps surprisingly, increasing the number of berths at ports and deepening channels have less effect. While Penang (Malaysia) has the lowest costs among the ports studied, Mumbai (India) experienced the greatest improvement in relative costs between 1997 and 2005. Suzhou Park in the PRC includes free-trade zones with streamlined customs procedures and dedicated transport routes to ports, and has thereby reduced both costs and waiting times (Hausman et al. 2005). In the case of Indonesia, Patunru et al. (2009) found that limitations in soft infrastructure, such as labor skills, regulation, bureaucracy, and other institutional factors, reduce port efficiency. Port performance is crucial to the Indonesian

archipelago.[27] Lack of direct competition among ports controlled by the same government authority is also a critical factor.

Investments in port infrastructure, especially procuring new cranes, not only lower the cost and raise the efficiency of handling existing trade flows; they can also increase a port's capacity to handle new flows and thus influence the composition of trade. Standardized containers yield cost savings by allowing goods to be packed once and moved over long distances via a combination of transport modes—for example, truck, rail, ocean liner, rail, then truck again—without being unpacked and repacked. Given the advantages of containerization for certain product categories, improvements in port infrastructure can reduce unit costs further as the share of trade shipped by container rises.

ICT is an increasingly productive complement to physical infrastructure. ICT helps to reduce the costs of finding suppliers, agreeing on contracts, monitoring their implementation, and tracking the location and status of shipments. Fink et al. (2002) found that higher telecommunications costs dampen bilateral trade flows, especially for differentiated (rather than homogeneous) products. In particular, as smaller shipments of a wider variety of higher value-added products proliferate, the demand for ICT services rises. The same is true as the growth of trade in services outpaces that in manufacturing. Trade in services such as banking and business services, or communications, is highly dependent on a well-developed ICT infrastructure in both the exporting and importing countries. While the private sector is especially adept in the ICT sector, the need for mutually interfacing logistics services at both ends of a trade route is an area where regional cooperation could help users to share information, learn from best practices, and coordinate capacity building to enhance trade.

[27] In the Indonesian archipelago, where around 90% of external trade (and much of domestic trade) passes through ports, exporters seeking to distribute raw materials tend to follow the "trade follows the ships" principle: they are attracted to ports with shipping routes that best reach the desired markets (Patunru et al. 2009). Regions where service-sector exports are more important tend to follow the "ships follow the trade" principle, whereby ships are routed to serve the desired regions.

In short, soft infrastructure is at least as important as physical infrastructure, especially where hard infrastructure is already well established. Fortunately, soft infrastructure is particularly amenable to regional cooperation agreements.

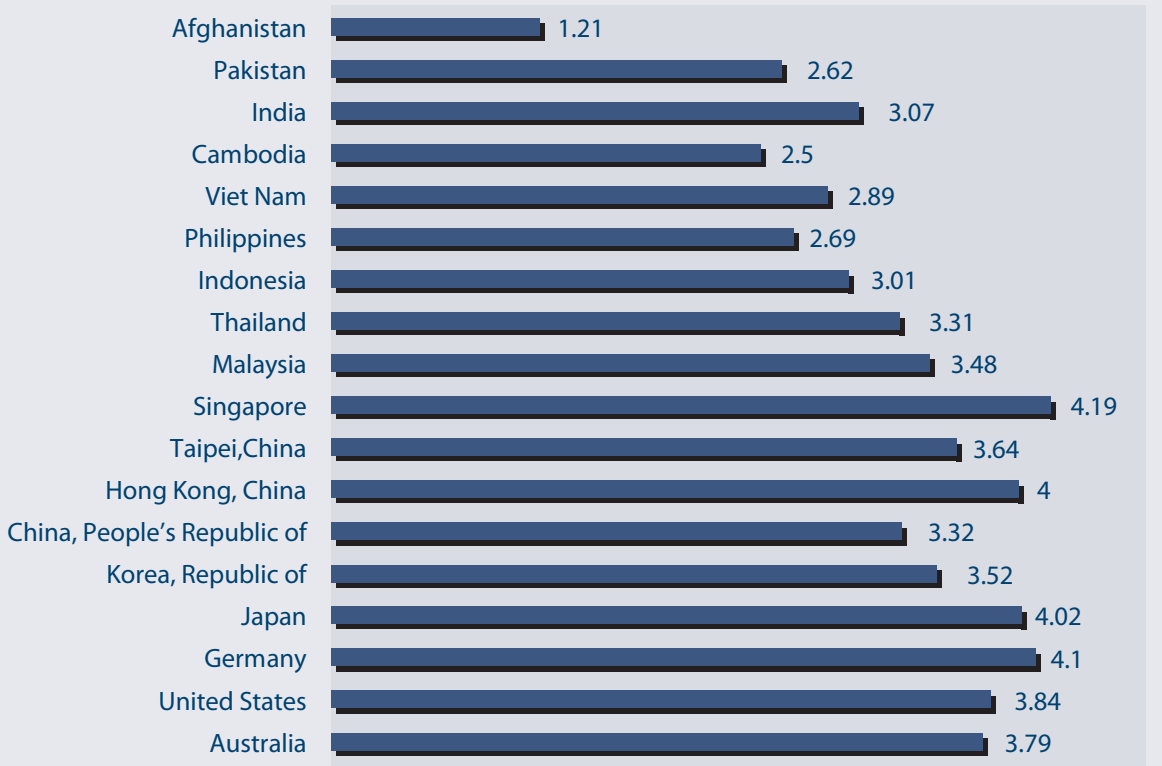
Logistics Services

Logistics and infrastructure services are a vital component of Asia's global competitiveness. Supply chains that span the region rely on them, and the location of FDI within the region is shaped by them. Improvements in infrastructure service efficiency can lead to cost savings equivalent to moving production to locations thousands of kilometers closer to trading partners. Economies such as PRC; Hong Kong, China; Republic of Korea; Malaysia; Singapore; Taipei,China; and Thailand have built well-developed logistics systems to facilitate international trade, but these will require much greater investment if economic activities are to expand inland from the coastal areas, where they currently concentrate.

An international comparison of logistics performance (World Bank 2007b) found that East Asian economies perform relatively well compared with South Asian countries, but that most still lag well behind high-income countries, with the exception of Singapore and Hong Kong, China (Figure 2.6). In Central Asia, transport costs account for nearly 20% of the value of trade costs, because transport and logistics services are expensive and of low quality.

The challenges of providing efficient logistical support rise as countries move into progressively more complex and higher value manufacturing, and as production processes become increasingly fragmented. Already, there is a premium on timeliness and reliability of delivery, care and security in handling and transporting, and certification and standardization of product quality. Improving the quantity and quality of logistics services in trade enhances competitiveness and value added. Freight forwarding, warehousing, storage, packaging, shipping services, and ICT infrastructure services are becoming increasingly

Figure 2.6. International Logistics Performance Index



Notes: The international logistics performance index mainly reflects infrastructure, customs, international shipments, logistics competence, tracking and tracing, domestic logistics costs, timeliness, etc. Scores range from 1 to 5, 1 being the lowest.
Source: World Bank (2007b).

important. Fortunately, competition among private sector providers of logistics services is continually stimulating efficiency improvements.

The importance of high-quality logistics varies by commodity depending on three factors (Arnold 2009): First is the value of the commodity per shipment unit, for example, per metric ton or TEU. Second is the shelf life of the commodity, reflecting physical deterioration or volatility of demand. The third factor is importers' scheduling requirements; timeliness is particularly important to just-in-time manufacturers—in sectors such as fashion clothing or auto parts—and retailers with coordinated national sales programs.

To sum up, logistics services are increasingly important as the value of products, and the demand for timely delivery, rise.

Foreign Direct Investment Location

Trade, investment, and production patterns are partly determined by differences in infrastructure service quality across countries. Kimura et al. (2007) found that geographical distance reduced trade in machinery parts and components much less in East Asia than in Europe. This implies that the costs of production fragmentation are substantially lower in East Asia than in Europe, contributing to large differences in the development of international production and distribution networks. On the other hand, Kuroiwa (2008) found that the automotive industry in Southeast Asia is geographically concentrated, as its parts and components are heavy and bulky, and transporting them is relatively costly. As a result, the share of local content rose and that of imported components declined during the 1990s.

Reductions in transport costs also have an indirect impact on FDI inflows by lowering the cost of spreading production across several countries in order to take advantage of their comparative advantages. Increased FDI, in turn, can further boost regional trade, adding to the direct effect of reduced transport costs arising from improvements in infrastructure near border areas. If the advantages of fragmenting production across economies in a region outweigh those from concentrating it together, reductions in transport costs make FDI complementary to trade. For instance, in Southeast Asia's electronics industry, where components are generally small and light (relative to value added), with relatively low transport costs, cross-border production networks proliferated in the 1990s. This can create a virtuous circle of cross-border infrastructure development, trade, and investment that fosters increased trade and economic growth.

To compete for larger shares of regional supply chains, countries have strived to improve their infrastructure services. In Malaysia, for instance, the government has actively promoted infrastructure development to strengthen its competitive and comparative advantage.

Since the mid-1980s, Malaysia has pursued an FDI-led, export-oriented development strategy, with FDI contributing to the economy's integration in global production networks. Malaysia has enhanced its geographical attractiveness to foreign firms as a key link in global supply chains through infrastructure development and the resulting high-quality services. Ang (2007) found that, in Malaysia, providing an adequate infrastructure base stimulates FDI inflows. Its exchange-rate policy has also played an important role.

Tham et al. (2009) shed light on infrastructure's role in attracting export-oriented FDI by analyzing the sectoral and location pattern of FDI in Asia, as well as by conducting interviews with the local managers of foreign firms with subsidiaries involved in international trade. FDI was found to tend toward areas with relatively good infrastructure and amenities. Infrastructure improvements thus help attract FDI, which, in Asia, has frequently been directed toward export sectors, in turn influencing patterns and quantities of imported raw materials and intermediate inputs.

Amiti and Javorcik (2008) argued that access to markets and access to suppliers are the most important factors affecting foreign entry. Their influence on FDI location decisions was four times greater than that of production costs. In the PRC, access to markets and suppliers within the province of entry matters more than access to the rest of the country, consistent with observed market fragmentation. A one-standard-deviation increase in the number of sea berths increases foreign entry by around 11%, while an equivalent increase in railway length increases it by 7%. This reinforces the observation that provinces with more developed ports, and, to a lesser extent, a more developed rail network, tend to attract greater FDI flows.

To sum up, FDI is important for Asia's trade growth, especially in parts and components. Infrastructure is important for attracting and keeping FDI, especially trade-related infrastructure.

2.4. Enhancing Regional Energy Trade

Meeting Asia's soaring demand for energy is a huge challenge for the region—not least because Asia's huge potential for regional energy trade is stymied by a lack of trade-supporting infrastructure such as gas pipelines, power grid connections, and hydroelectric dams.

Nearly half of the increase in global demand for primary energy[28] between 2000 and 2020 is expected to occur in Asia (as detailed in Table A2.4 in the Appendix). Demand is expected to grow by 3.2% a year, compared with 2% for the world as a whole. Most of the increase will come from the PRC, India, Indonesia, and Thailand, but the highest rates of growth will be in the Philippines and Viet Nam. Increased investment in energy infrastructure to ensure reliable, affordable—and low-carbon—supplies is therefore vital. Worldwide, the International Energy Agency (IEA) estimates that the energy sector requires investment of around $16 trillion between 2003 and 2030 to meet rising global demand, of which developing Asian economies will need $4–5 trillion (IEA 2003). The electricity sector requires the biggest investment, followed by the oil and gas sectors (IEA 2006).

Asia has substantial energy resources—7% of the world's oil reserves, 12% of its natural gas, and 32% of its coal in 2006 (Table 2.5)—to meet this projected demand, but these are unevenly distributed across the region, and often untapped. The PRC, India, and Kazakhstan have 98% of Asia's coal reserves. Kazakhstan has almost half of the region's oil, and Turkmenistan has by far the highest gas reserves. Overall, Asia accounted for 13% of the world's fossil fuel exports and 20% of its imports in 2003.

Since some Asian countries are net energy exporters and others are net importers, there is huge potential for mutually beneficial energy trade. For instance, the PRC is a major exporter of coal and the Republic of Korea a big importer, while Turkmenistan and Indonesia are big gas exporters (Table 2.6).

[28] Primary energy consists of coal, gas, oil, and electricity.

Table 2.5. Proven Energy Reserves in Million Tons of Oil Equivalent and Percent of World Total, 2006

Region	Oil		Gas		Coal	
	Million Tons	% of World Total	Million Tons	% of World Total	Million Tons	% of World Total
Developing Asia	**11,203**	**7.1**	**18,561**	**11.6**	**143,051**	**31.7**
East Asia	2,219	1.4	2,204	1.4	58,927	13.0
Central and West Asia	6,543	4.1	8,890	5.6	20,827	4.6
The Pacific	–	–	392	0.2	–	–
South Asia	777	0.5	1,359	0.8	60,843	13.5
Southeast Asia	1,665	1.1	5,716	3.6	2,454	0.5
Other Developing Countries	**137,897**	**87.3**	**127,580**	**79.8**	**142,461**	**31.5**
OECD	**8,935**	**5.7**	**13,776**	**8.6**	**166,158**	**36.8**
World	**158,035**	**100.0**	**159,917**	**100.0**	**451,670**	**100.0**

OECD = Organisation for Economic Co-operation and Development.
– data not available.
Notes: Regional aggregates and the world total calculated based on data for 48 countries that reported. East Asia includes: Hong Kong, China; Japan; Mongolia; People's Republic of China; Republic of Korea; and Taipei,China. Central and West Asia includes: Armenia, Azerbaijan, Georgia Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan. The Pacific includes: Cook Islands, Democratic Republic of Timor-Leste, Federated States of Micronesia, Fiji Islands, Kiribati, Marshall Islands, Nauru, Papua New Guinea, Republic of Palau, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu. South Asia includes: Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka. Southeast Asia includes: Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Viet Nam.
Source: World Resources Institute (2009).

A World Bank (2008a) study for Asia concluded that increasing regional energy trade would benefit all countries in the region, and that governments should make it a policy priority. Improving power grid interconnections would allow countries with an electricity surplus to export power to those with a shortfall, while building oil and gas pipelines would also permit greater regional trade. Relatively smaller economies such as Bhutan, Cambodia, Kyrgyz Republic, Lao PDR, Myanmar, Nepal, Tajikistan, and Turkmenistan have hydropower or hydrocarbon resources far in excess of their energy needs. Energy exports could bring them huge economic gains. For example, Bhutan's electricity exports in the 2007 fiscal year were expected to amount to nearly 25% of GDP and 60% of government revenues (ADB 2008h).

In other countries such as Afghanistan, Bangladesh, India, Pakistan, and Sri Lanka, energy demand growth far outstrips domestic

Table 2.6. Pattern of Asia's Energy Exports and Imports, by Country and Commodity[a] (in percent)

Region/Economy	Exports			Imports		
	Oil and Petroleum Products	Natural Gas	Coal	Oil and Petroleum Products	Natural Gas	Coal
East Asia	**20**	**1**	**51**	**46**	**50**	**65**
China, People's Rep. of	9	1	51	21	0	7
Hong Kong, China	1	0	0	2	3	7
Korea, Rep. of	10	0	0	22	47	51
Central and West Asia	**24**	**45**	**8**	**3**	**28**	**4**
Armenia	0	0	0	0	2	0
Azerbaijan	4	0	0	0	7	0
Georgia	0	0	0	0	2	0
Kazakhstan	17	9	8	1	15	1
Kyrgyz Republic	0	0	0	0	1	1
Pakistan	0	0	0	2	0	2
Tajikistan	0	0	0	0	1	0
Turkmenistan	2	33	0	0	0	0
Uzbekistan	0	3	0	0	0	0
South Asia	**5**		**1**	**18**		**18**
Bangladesh	0	–	0	1	–	0
India	5	–	1	16	–	17
Sri Lanka	0	–	0	1	–	0
Southeast Asia	**51**	**54**	**41**	**33**	**22**	**14**
Indonesia	13	32	38	5	0	0
Malaysia	11	17	0	3	0	5
Myanmar	0	5	0	0	0	0
Philippines	1	0	0	3	0	4
Singapore	18	0	0	14	9	0
Thailand	3	0	0	6	13	5
Viet Nam	6	0	3	2	0	0
Total	**100**	**100**	**100**	**100**	**100**	**100**

– data not available.
Note:
[a] As a percentage of total Asian exports and imports of that commodity.
Source: World Resources Institute (2009).

supply, and this gap will continue to widen unless domestic supplies are supplemented by imports. Importing energy would permit their economies to grow faster. For example, in India unmet electricity demand in the 2007 fiscal year was estimated at 54,916 gigawatt-hours, valued at $12.1 billion on the basis of short-term marginal cost in

the Indian grid. The value of the industrial production forgone was doubtless several times higher (World Bank 2007c, Bhattacharya and Kojima 2008).

Regional energy trade would also enhance national energy security by diversifying energy forms and supply sources and lowering costs. Studies estimate that regional cooperation in the GMS would reduce the subregion's total discounted energy costs by an estimated $220 billion, or 19% of total energy costs (ADB 2008a). Such huge gains are possible because energy demand is expected to rise sharply, and importing from neighboring countries is the cheapest way of meeting that demand.

Regional cooperation and energy trade would also benefit the environment. In India, which relies heavily on domestic coal, carbon dioxide emissions are forecast to rise from 4% of the world total to around 13% by 2030. Imported hydropower and natural gas would moderate this rise. Major cross-border energy projects involving hydro, nuclear, and wind power could also reduce electricity generation from coal and oil and thus limit environmental damage. The net benefit of building cross-border infrastructure in order to access clean energy would total around $3.5 billion; East Asia alone would gain more than $2 billion (Bhattacharya and Kojima 2008). Clearly, there is huge potential for Asia to replicate and build on the success of the GMS in fostering energy trade and cooperation.

2.5. Toward Greater Trade

Asia's trade-related infrastructure has greatly improved, but it must continue to do so to sustain economic growth and regional integration. Asia's international trade is growing in value and shrinking in weight per unit value. Exports are diversifying across new markets with smaller flows, and intraregional trade in parts and components for regional production networks accounts for a growing share of total trade. These trends underscore the need for speed, flexibility, and information. This requires efficient and flexible logistic networks that provide uncomplicated connections between different transport modes and

make it possible to trade with more places, in less time, at lower cost. The logistics networks need to be complemented by investments in ICT, human capacity development, cooperation on trade facilitation, and improvements in "soft infrastructure." Regional infrastructure that facilitates the expansion of trade along these lines will boost a country's export competitiveness and its efficient integration into the global economy.

As production becomes increasingly fragmented and traded more internationally, cooperation among economies participating in production networks is becoming more important. The competitiveness of each country's production depends on that of the other countries in a production network as well as on the efficiency of the trading links among them. They thus have a strong incentive to cooperate with each other, particularly on improving physical infrastructure and harmonizing soft infrastructure to reduce the costs of trading among them.

The sequencing of hard and soft infrastructure in regional infrastructure investments is important, particularly as transport corridors develop into more diversified economic corridors. Once physical infrastructure has been built, developing complementary soft or ICT infrastructure may be more important than further investments in transport, while maintaining (or increasing) spending on operation and maintenance. For example, once a two-lane highway has been built, streamlining customs facilities may boost trade more than widening the road to four lanes.

Efficient and cost-effective logistics services are increasingly important for timely delivery. As production supply chains become more geographically fragmented and extended, logistics can have more impact than transport on trade costs. Effective logistics services need to be complemented by ICT, soft infrastructure, and education and training.

Flexibility, as well as timeliness, will become more valuable as greater trade implies greater potential vulnerability to external shocks such as financial turmoil or sharp fluctuations in fuel prices. An extended

economic downturn in export markets would diminish the demand for transporting goods and passengers. As a result, fuel costs, congestion, and economies of scale in shipping would likely decline. But so too would export prices, potentially raising ad valorem trade costs and altering the prices of traded goods relative to those of nontradables. In general, one would expect the direct price effect to dominate, favoring trade in goods that are smaller, lighter, and of higher unit value. Trade finance may also be negatively affected, reducing the ability of trade to contribute to economic recovery in a region where it has been highly important in the past.

Infrastructure must adapt to changes in export and import demand in an efficient manner (for example, shifting towards more fuel-efficient transport). Similarly, logistics systems must realign to facilitate changes in trade patterns and flows.

Factors such as high freight costs, delays in customs clearance, unofficial payments, slow port handling, and poor governance are particularly damaging because they impede this flexibility. They are also barriers to trade that need to be addressed through regional cooperation on trade facilitation measures. Infrastructure improvements that reduce the costs of international trade are crucial for the region to realize the full gains from recent and prospective trade liberalization. This should be a priority in negotiations on bilateral and regional trade agreements, which can provide an added incentive and commitment to reform.

Asian countries need to cooperate to develop trade-supporting infrastructure, but match infrastructure developments to their individual trade characteristics, industrial structure, and plans. Once hard infrastructure has been developed, trade liberalization and soft infrastructure are increasingly important as exports move up the value-added supply chain.