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The methodology of our research needs much refining and improvement, but we hope that the research will pave the way for improved collective actions among countries and international institutes, and that it will be a useful reference for further actions to be considered by donor agencies and funding institutions, inter alia ADB.

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CHAPTER 1.

CONCEPTUAL FRAMEWORK

The Comprehensive Asia Development Plan (CADP) will provide a grand spatial design of economic infrastructure and industrial placement in ASEAN and East Asia and will claim to pursue both deepening economic integration and narrowing development gaps. This chapter presents our novel conceptual framework based on new waves of international trade theory: the extended fragmentation theory and new economic geography.

1-1. What is the Comprehensive Asia Development Plan?

East Asia[1] has been leading the world in sustained economic growth for the past three decades. The strength of the ASEAN and East Asian economies has resided in the unprecedented development of international production networks. After demonstrating strong recoveries from two massive economic crises and further upgrading of the economy, East Asia has now truly become the "Factory of the World."

However, East Asia is now facing a big challenge. On the one hand, economic forces in the globalizing era require an even higher level of *de jure* and *de facto* economic integration than now. On the other hand, East Asia consists of countries and regions widely different in their development stages, with diversified historical, cultural, and political backgrounds. The reconciliation of two objectives, i.e., deepening economic integration and narrowing development gaps, is an urgent issue for policy discussion in East Asia.

The Comprehensive Asia Development Plan (CADP) will provide a grand spatial design of economic infrastructure and industrial placement, and will claim to pursue both deepening economic integration and narrowing development gaps at the same time. We apply a novel analytical approach based on new waves of international trade theory: the extended fragmentation theory and new economic geography.

The CADP is "comprehensive" in the sense that the whole plan is based on a rigorous conceptual framework, provides robust empirical evidence, and presents

[1] In the CADP, the geographical concept "East Asia" is defined in a flexible manner as "ASEAN and beyond," depending on the context. It sometimes covers Southeast Asia and Northeast Asia or ASEAN+3 while it often includes India, Australia, and New Zealand corresponding to ASEAN+6.

concrete development strategies with more than 600 prospective projects on logistics and other economic infrastructure. It covers a wide range of policy modes that help to bridge infrastructure development and industrialization.

"Asia" here covers countries participating in the East Asia Summit, with emphasis on ASEAN and surrounding countries or regions in East Asia.

"Development" refers not only to macroeconomic growth but also to various aspects of overall economic development, focusing on economic integration and development gaps.

"Plan" means an indicative plan, which provides a framework for policy planners to formulate and implement infrastructure development and industrialization.

1-2. The emergence of international production networks

1-2-1. Novel pattern of industrial location and international trade

East Asia has developed unprecedented international production networks (Ando and Kimura, 2005).

The pattern of international division of labor and international trade in East Asia is no longer fully explained by the textbook version of international trade theories. The international division of labor is not industry-wise but production-process-wise, which differs from a standard setting of comparative advantage models such as the Ricardian model and the Heckscher-Ohlin model. Neither does intra-industry trade, based on the vertical division of labor, follow the formulation of the Helpman-Krugman intra-industry trade model with its horizontal production differentiation.

What we observe is fragmentation of production and the formation of industrial agglomerations. Such production networks have developed particularly in machinery industries in a salient manner but are observed in other industries to some extent. This unprecedented pattern of international division of labor and international trade requires a novel analytical framework.

1-2-2. New trade and investment regime

East Asia became a forerunner in developing international production networks because of its novel policy regime for trade and investment.

Aggressive attraction of foreign direct investment (FDI) by developing East Asian countries started in the latter half of the 1980s. International competition in attracting FDI became harsh in the early 1990s, and the accumulation of investment liberalization/facilitation and trouble-shooting helped create a new investment climate

in the 1990s. Unilateral "race-to-the-bottom" trade liberalization occurred, particularly in electronic parts and components under the umbrella of the Information Technology Agreement (ITA) (Baldwin, 2006).

After the Asian currency crisis (1997-), Asian regionalism was accelerated, and overall trade liberalization in ASEAN under the ASEAN Free Trade Area (AFTA) as well as ASEAN and beyond under the ASEAN+1 FTAs proceeded, together with various improvements in the trade and investment regime. As a result, favorable economic and policy environments for international production networks were created.

1-2-3. Evolving vibrant role of multinationals

Designers and coordinators of international production networks are primarily multinational enterprises (MNEs). These include MNEs with various firm nationalities; not just Japanese, Korean, Taiwanese, Hong Kong, and other East Asian MNEs but also American, European, and other MNEs; all are actively utilizing the mechanism of international production networks.[2]

East Asian MNEs have had strength in machinery industries. Machines typically consist of a large number of parts and components, each of which is produced by diversified technologies, which makes machinery industries particularly suitable for fragmentation of production. East Asian MNEs also had long-term experience in inter-firm production relationships; vertical subcontracting in Japan, horizontal subcontracting in Taiwan, and cross-border contract manufacturing between Hong Kong and Guandong Province are examples. These became the prototypes of inter-firm fragmentation. We now observe local firms' penetration into production networks run by MNEs, particularly in industrial agglomerations.

1-2-4. New development strategies

Developing East Asia is presenting novel development strategies. Its nations aggressively utilize MNEs in an open setting and accept almost all sorts of MNEs, which enables them to participate in international production networks and form industrial agglomerations. Then local firms/entrepreneurs/engineers can be helped to develop via their penetration into the production networks of MNEs. These strategies are fundamentally different from the traditional infant industry protection argument or strategies with import-substituting FDI. They are also different from a simple acceptance of exporting MNEs. Developing East Asia has much more effectively taken advantage of globalizing forces for its economic development than other

[2] See Ando, Arndt, and Kimura (2006) for a wide range of common elements between the US and Japanese MNEs in utilizing the mechanism of production networks.

developing regions in the world.

1-2-5. Logistics and economic infrastructure for industrialization

There is no doubt that the development of logistics and economic infrastructure is crucial to industrial development in general. However, the role of the infrastructure for economic development has not been thoroughly specified in a rigorous conceptual framework.

A number of significant development studies, initiatives, and plans for logistics and economic infrastructure have been conducted and implemented in ASEAN, East Asia, and the whole of Asia; examples include the Greater Mekong Sub-region (GMS), the Indonesia, Malaysia, Thailand Growth Triangle (IMT-GT), the Brunei, Indonesia, Malaysia, Philippines East ASEAN Growth Area (BIMP-EAGA), Infrastructure for a Seamless Asia (ADB and ADBI, 2009), and the Asian Highway[3]. These studies, initiatives, and plans have made great contributions to the development of infrastructure in ASEAN and East Asia. However, the link between logistics/economic infrastructure and industrialization is not necessarily well established. For example, road construction in rural areas certainly helps, but could be even more significant if we had a clearer idea of what sort of cargos would be transported and how it would accelerate specific industries.

Spatial design of logistics/economic infrastructure, together with industrialization strategies with convincing conceptual framework, is called for.

1-3. The augmented fragmentation theory and new economic geography

The mechanics of international production networks as well as the role of logistics/economic infrastructure in industrialization are lucidly analyzed by the augmented fragmentation theory with a flavor of new economic geography.

1-3-1. Fragmentation: location advantages and service links

Although international production/distribution networks began to be created from the end of the 1980s, Jones and Kierzkowski (1990) made a head start in developing the theory of fragmentation. The theory pointed out fundamental differences between

[3] Up-to-date information on these initiatives can be found in the following websites; GMS (http://www.adb.org/gms/), IMT-GT (http://www.adb.org/IMT-GT/), BIMP-EAGA (http://www.adb.org/BIMP/), and the Asian Highway (http://www.unescap.org/ttdw/index.asp? MenuName= AsianHighway/).

intermediate goods trade and finished products trade, particularly in the flexibility of firm's decision making in cutting out production blocks and the existence of service link costs.

Figure 1-1. The fragmentation theory: Production blocks and service links

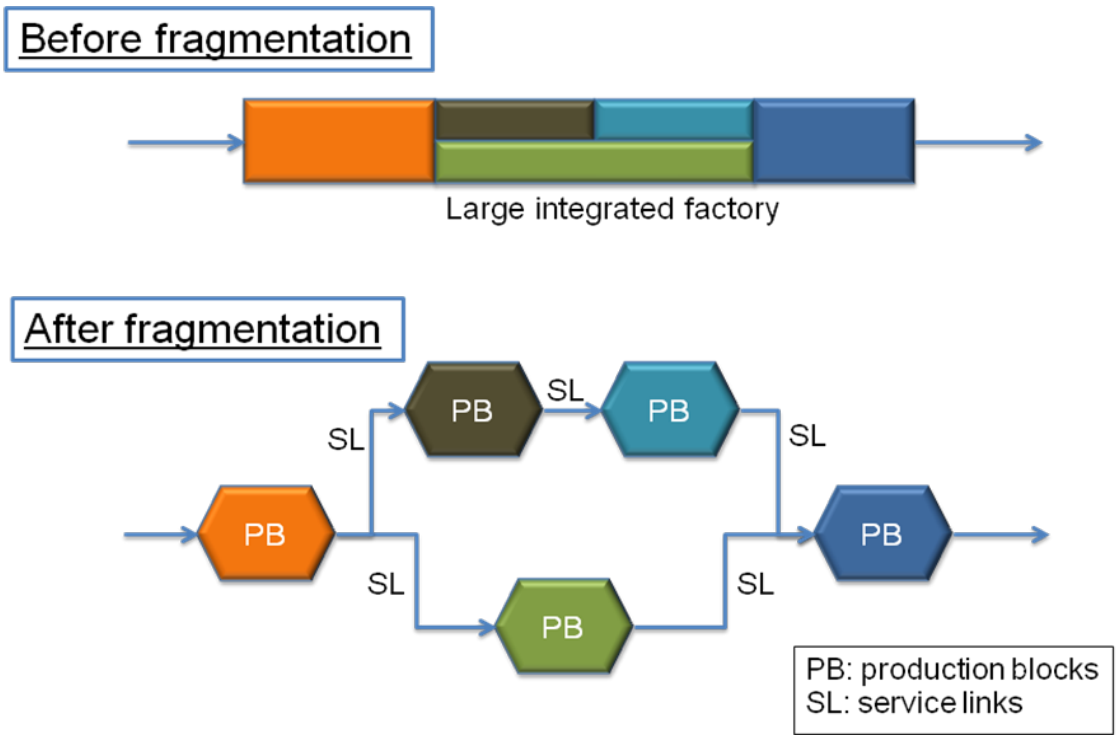


Figure 1-1 illustrates the original idea of fragmentation. Suppose that a firm originally produces a product from downstream to upstream in a big factory located in a developed country. The production processes in the factory, however, may have various characteristics; some would be capital or human-capital-intensive while others would be purely labor-intensive. Some would be capital-intensive, but needing 24-hour operation under the close supervision of engineers. Hence, if the firm can separate some of the production processes, design production blocks, and locate them in other places, the final total cost may be reduced. This is the so-called fragmentation of production.

Fragmentation of production is economically viable if (i) the saving of production costs *per se* in production blocks is large and (ii) incurred service link costs for connecting remotely located production blocks are small. Whether (i) is met depends on the technical separability of production processes and the availability of different location advantages. Firms have a certain degree of freedom on how to cut out production blocks so as to exploit differences in location advantages in remote areas,

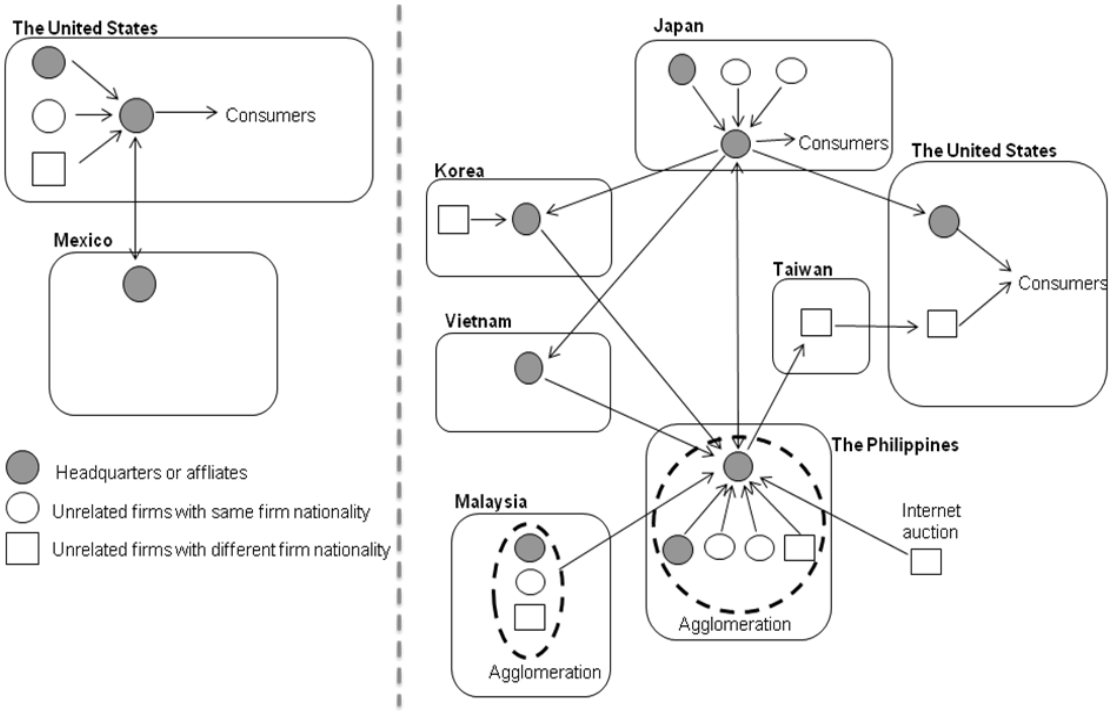
while host countries may seek niches of location advantages for each production block. On the other hand, (ii) depends not only on trade barriers and transport costs but also on various coordination costs, which make transactions in production networks relation-specific. In addition, service links often present economies of scale. These are the reasons why a simple disaggregation of industries in the framework of traditional trade theories cannot fully explain the division of labor at the level of production processes.

1-3-2. Intra-firm and arm's length fragmentation

Although cross-border production sharing exists between the US and Mexico, between the US and Costa Rica, and between Western Europe and Eastern Europe, these production-process-wise division of labor typically has a relatively simplistic structure with back-and-forth, closed-loop, and intra-firm transactions. For example, a US firm prepares a set of parts and components in the US, sends them to its own factory in Maquila in Mexico, and the factory sends finished products back to the US market (see the left-hand-side picture in Figure 1-2). In the case of East Asia, we observe open-ended "networks" of production-process-wise division of labor that cover a number of countries with a sophisticated combination of intra-firm and arm's length transactions (the right-hand-side picture in Figure 1-2). Transactions at long distance are likely to be intra-firm while those over short distances are predominantly arm's length. Particularly in some specific places, industrial agglomerations have begun to be created in which vertical, arm's length, and just-in-time transactions among multinationals and local firms are possible.

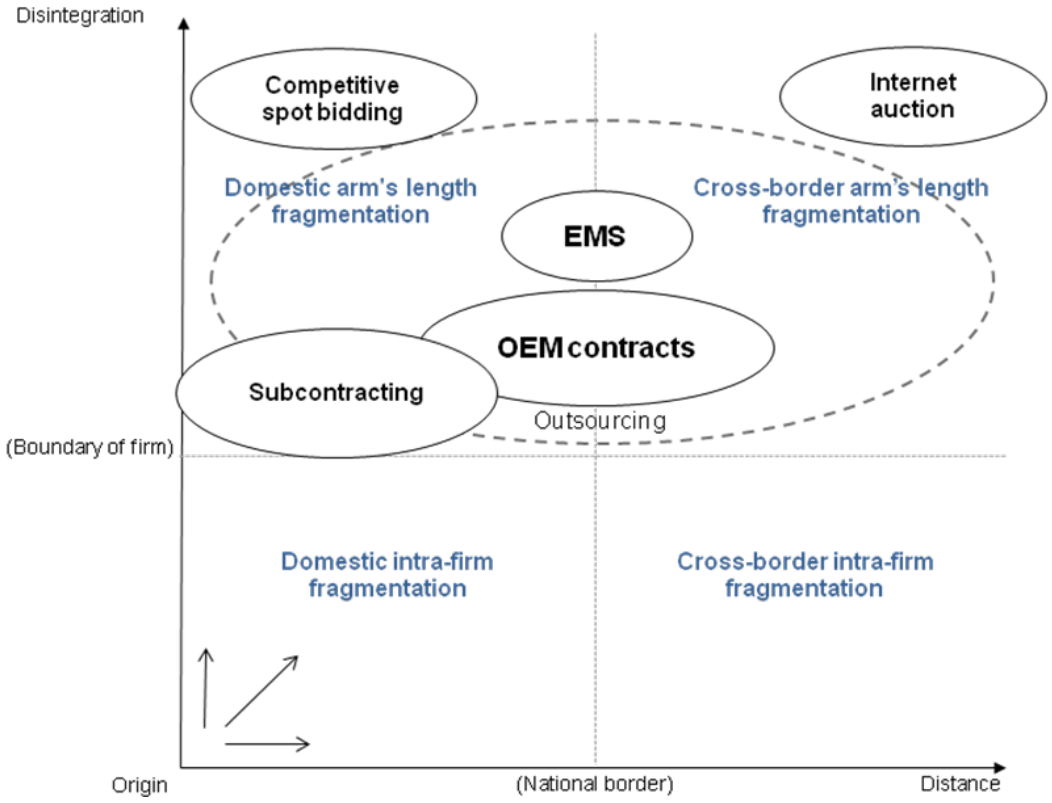
The concept of two-dimensional fragmentation proposed by Kimura and Ando (2005) expands the outset of fragmentation in order to analyze the sophistication of international production/distribution networks in East Asia. In addition to fragmentation in the dimension of geographical distance, the extended framework introduces fragmentation in the dimension of disintegration, where a firm decides whether to keep some economic activities inside the firm or to outsource them to unrelated firms (Figure 1-3). This framework well explains the sophisticated nature of fragmentation in East Asia, where both intra-firm and arm's-length (inter-firm) fragmentation of production processes flourish. By introducing the close relationship between geographical proximity and arm's-length transactions, the framework can also neatly describe the simultaneous development of the firm-level fragmentation of production processes and the industry-level formation of agglomeration.

Figure 1-2. Production networks: The US-Mexico nexus versus East Asia



Source: Ando and Kimura (2009).

Figure 1-3. Two-dimensional fragmentation: An illustration



Source: Kimura and Ando (2005).

By employing the framework of two-dimensional fragmentation, we can list a number of policies that make fragmentation viable in an organized manner. Table 1-1 presents a 2x3 matrix, which consists of two dimensions of fragmentation and three kinds of cost reduction sought, i.e., the reduction in network set-up costs, service link costs, and production costs in production blocks. The table indicates that trade and investment liberalization is certainly an essential precursor to the development of production networks, but other policies such as trade facilitation, the development of logistics infrastructure, and various domestic policies are also crucial.

It should also be noted that the relative importance of these policies changes according to the degree of participation in production networks. In the case of countries/regions that have not yet participated in production networks, set-up costs and service link costs for fragmentation in terms of the geographical distance are priorities. Production costs are also important, but some improvement of local niches, rather than the improvement of the whole economy, may suffice. At the stage of forming industrial agglomerations, the overall improvement of cost conditions for fragmentation over a geographical distance becomes important, and the development of disintegration-type fragmentation also comes into the scope.

Table 1-1. The 2x3 policy matrix fragmentation and agglomeration

	Reduction in fixed costs to develop production/distribution networks	Reduction in service link costs connecting production blocks	Further costs reduction in production cost per se in production blocks
Fragmentation along the distance axis	Policies to reduce investment costs	Policies to overcome geographical distance and border effects	Policies to strengthen location advantages
	(1) improvement in stability, transparency, and predictability of investment-related policies; (2) investment facilitation in FDI-hosting agencies and industrial estates; and (3) liberalization and development in financial services related to capital investment.	(1) reduction/removal of trade barriers such as tariffs; (2) trade facilitation including simplification and improved efficiency in custom clearance/procedures; (3) development of transport infrastructure and improved efficiency in transport and distribution services; (4) development of telecommunication and ICT infrastructure; (5) improved efficiency in financial services related to operation and capital movements; and (6) reduction in costs of coordination between remote places by facilitation of the movement of natural persons.	(1) establishment of educational/occupational institutions for personnel training to secure various types of human resources; (2) establishment of stable and elastic labor-related laws and institutions; (3) establishment of efficient international and domestic financial services; (4) reduction in costs of infrastructure services such as electricity and other energy, industrial estates services; (5) development of agglomeration to facilitate vertical production chains; (6) establishment of economic institutions such as investment rule and intellectual property rights; and (7) various trade and investment facilitation.
Fragmentation along the disintegration axis	Establishment of economic environment to reduce set-up costs of arm's length transactions	Development of institutional environment to reduce the cost of implementing arm's length transactions	Policies to strengthen competitiveness of potential business partners
	(1) establishment of economic system to allow co-existence of various business partners as well as making various types of contracts; (2) various policies to reduce costs of information gathering on potential business partners; (3) securing fairness, stability, and efficiency in contract; and (4) establishment of stable and effective institutions to secure intellectual property rights.	(1) policies to reduce monitoring cost of business partners; (2) improvement in legal system and economic institutions to activate dispute settlement mechanism; and (3) policies to promote technical innovations in modulation to further facilitate outsourcing.	(1) hosting and fostering various types of business partners including foreign and indigenous firms; (2) strengthening supporting industries; and (3) various policies to promote the formation of agglomeration.

1-3-3. Degree of freedom in fragmentation and investment climate

One important property of fragmentation along the geographical distance axis is that a firm can decide how to cut out production processes and design production blocks. Considering the most effective matching of location advantages with its own firm-specific assets such as production technology, managerial ability, and inter-firm connections, a firm can design and organize production networks with a certain degree of freedom. This provides ample flexibility for a firm to adjust for niches of location advantages.

On the other side of the coin, developing countries may try to provide proper niches in location advantages, rather than countrywide fundamental improvement of the investment climate, in order to attract production blocks. With the rise of fragmentation, it would be much easier for less developed countries (LDCs) to start industrialization than in the past by attracting some pieces of production blocks.

1-3-4. Technology transfers and spillovers

Fragmentation along the disintegration axis also provides flexibility in setting up inter-firm division of labor. Matching between business partners can be in any form, depending on their firm-specific assets. It means that even local firms may seek some niches to come into production networks.

The competitors of local firms are multinational SMEs; the former typically have price competitiveness while the latter are strong in non-price competitiveness, in terms of quality, delivery, and reliability. In order to gain non-price competitiveness, the activities of local firms must be carried out in industrial agglomerations. Once the relationship with MNEs is established, technology spillovers or even intentional technology transfers from MNEs to local firms may start.

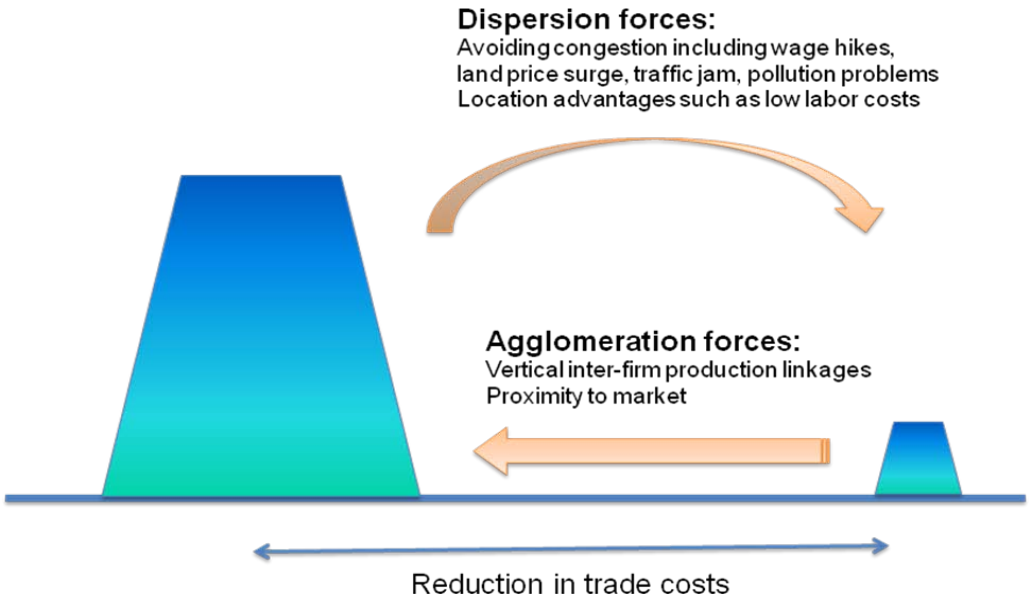
1-3-5. Knife-edge of agglomeration and dispersion forces

Lessons from new economic geography are important supplements in our conceptual framework.[4]

The fragmentation theory argues that a reduction in service link costs may be a trigger for developing countries/regions to attract FDI and participate in production networks. However, lower trade costs do not automatically result in the dispersion of economic activities. Rather, according to new economic geography, a reduction in trade cost generates two countervailing forces: agglomeration forces and dispersion forces (Figure 1-4).

[4] For new economic geography, see Fujita, Krugman, and Venables (1999), Baldwin, Forslid, Martin, Ottaviano, and Robert-Nicoud (2003), and Combes, Mayer, and Thisse (2008).

Figure 1-4. Agglomeration and dispersion in new economic geography



Agglomeration forces make more and more economic activities be attracted to agglomerations. External economies of scale within a geographical boundary are generated in agglomerations due to vertical inter-firm production linkages for assemblers and parts and components producers, proximity to market for final goods producers, wholesalers, and retailers, and easy access to capital and human capital by firms. On the other hand, dispersion forces make some economic activities move from agglomerations to peripheries. As agglomerations become bigger, "congestion" occurs in the form of wage hikes, land price surges, traffic jams, and pollution problems so that certain kinds of economic activity start considering moving out of agglomerations. Differences in location advantages such as low labor costs in peripheral locations would provide more incentive for firms to relocate their production sites.

Controlling these two countervailing forces properly is the key for pursuing both rapid economic growth and narrowing development gaps. To achieve this goal, policies to enhance location advantages, which would work supplementary to a reduction in service link costs, are often required in order to attract economic activities to countries/regions at lower stages of development.

1-4. Fragmentation, agglomeration, and development stages

1-4-1. Evolution of fragmentation and agglomeration in development

The CADP applies a conceptual framework that is widely different from traditional

development theories and proposes a novel program based on new development strategies. To take advantage of the globalizing forces in corporate activities effectively, we should not depend on trade protection, but rather on free trade, proceed not only with tariff removal but also progressive trade liberalization and facilitation, and not limit ourselves to selective acceptance of FDI but engage in the aggressive attraction of all sorts of FDI.

The CADP provides a clear picture of an evolutionary process from simple, slow, and low frequency fragmentation to sophisticated, quick, and high frequency fragmentation; from thin slices of a value chain without tight local linkage to industrial agglomerations with active vertical links of production; and from industrialization heavily depending on MNEs to innovative industrial agglomerations consisting of both MNEs and local firms. East Asia is the most advanced region in the development of international production networks, and thus new development strategies should be established in order to pursue further economic integration with narrowing development gaps.

1-4-2. Three tiers with different degrees of participation in production networks

To fully utilize the mechanics of production networks, it is crucial to strategically classify stages of development in terms of the degree of participation in production networks.[5]

Tier 1 includes countries/regions that are already in production networks and where industrial agglomerations have started to form. Issues and challenges to take care of are upgrading industrial agglomerations, increasing innovation, and climbing up the ladder from middle-income to fully developed countries/regions.

Tier 2 corresponds to countries/regions that are not yet fully integrated into quick and high-frequency production networks. Issues and challenges are how to participate in quick and high-frequency production networks by reducing service link costs and improving location advantages for production.

Tier 3 comprises countries/regions that are not likely to come into quick and high-frequency production networks in the short run but would like to provide a new framework for industrial development with the development of logistics infrastructure as a trigger.

Our conceptual framework provides comprehensive strategies for spatial design of economic infrastructure and industrial placement.

[5] Full discussion on the three-tier development strategies will be provided in Chapter 3.

CHAPTER 2.

ASSESSMENT OF THE CURRENT EAST ASIAN ECONOMIES

This chapter presents quantitative evidence of the superior features, as well as uneven development, of international production networks in East Asia. These networks in East Asia have been the most advanced and sophisticated in the world and have been the source of dynamism for East Asian economies, with strong resilience against macro shocks. However, the geographical distribution of international production networks has been highly skewed and has covered just limited areas of East Asia. The mechanics of fragmentation and agglomeration should be more aggressively utilized in order to pursue both deeper economic integration and narrowing development gaps. Logistics and economic infrastructure is often the key to activating private dynamism

2-1. East Asian production networks leading the world

2-1-1. Global production networks and East Asia

The last two decades have been epoch-making in the development of international production networks all over the world. Some scholars prefer the word "global" instead of "international" or "regional" production networks or production sharing.[1] Indeed, some industries, such as electronics, have extended their production networks to the global scale with the involvement of MNEs with various firm nationalities. If we consider a longer value chain including not only manufacturing activities but also wholesales and retails, more industries can be regarded as possessing global networks. We would like to stress, however, that East Asian countries have often been at the center of such global production networks, particularly in quantitatively and qualitatively important sectors, i.e., machinery industries.

Figures 2-1 and 2-2 present the interconnectivity of international production networks, by illustrating the distribution pattern of two indicators for interconnectivity in machinery parts and components trade: the number of links and the clustering coefficient.[2] "Links" are here defined as two-way bilateral trade linkages in machinery

[1] See, for example, Ernst (2004) and Athukorala and Menon (2010).

[2] Machinery industries include general machinery, electrical machinery, transport equipment, and

parts and components. For the horizontal axis, the number of trading partners with two-way trade in machinery parts and components is counted and is divided by the maximal possible trading partners (100-1=99 in 1994, 85-1=84 in 2007). On the vertical axis, the "clustering coefficient" is the ratio of the number of links among the partner countries that a country of interest actually possesses. In sum, the horizontal axis represents the diversity or the extension of two-way trade linkages that a country of interest has participated in, and the vertical axis denotes the density of the links. The size of a bubble represents the volume of the two-way trade in machinery parts and components. Bubbles are shown in different colors by region: the blue colored bubbles for East Asian countries (ASEAN+6), red for European countries (EU27), green for American countries (North American Free Trade Agreement (NAFTA) and the Union of South American Nations (CSN)), and gray for others.

The larger the size of bubble and the higher the levels of the two indicators for the interconnectivity of networks, the more actively a country participates in production networks at the global level. Note, however, that there is a trade-off between the number of links, i.e., the number of partner countries, and the clustering coefficient whose denominator depends on the number of the partners. Despite such a trade-off, on the whole, bubbles shift to the upper right from 1994 to 2007, which indicates the networking in the two-way trade linkages of machinery parts and components, or the development of international production networks, stretched across the increasingly large number of countries. More importantly, East Asian countries except Brunei show outstanding shifts toward the upper right, and in particular, shifts to the right, from 1994 to 2007. As of 2007, along with larger sizes of bubbles, China, Japan, Korea, and other East Asian countries are concentrated in the upper right part of the plot region, suggesting that East Asian countries play a particularly important role in international production networks.

precision machinery (HS84-92). Machinery is classified into parts and components and finished products. The definition of machinery parts and components and other details of the figures are found in Kimura and Obashi (2010).

Figure 2-1. Inter-connectivity of international production networks in 1994

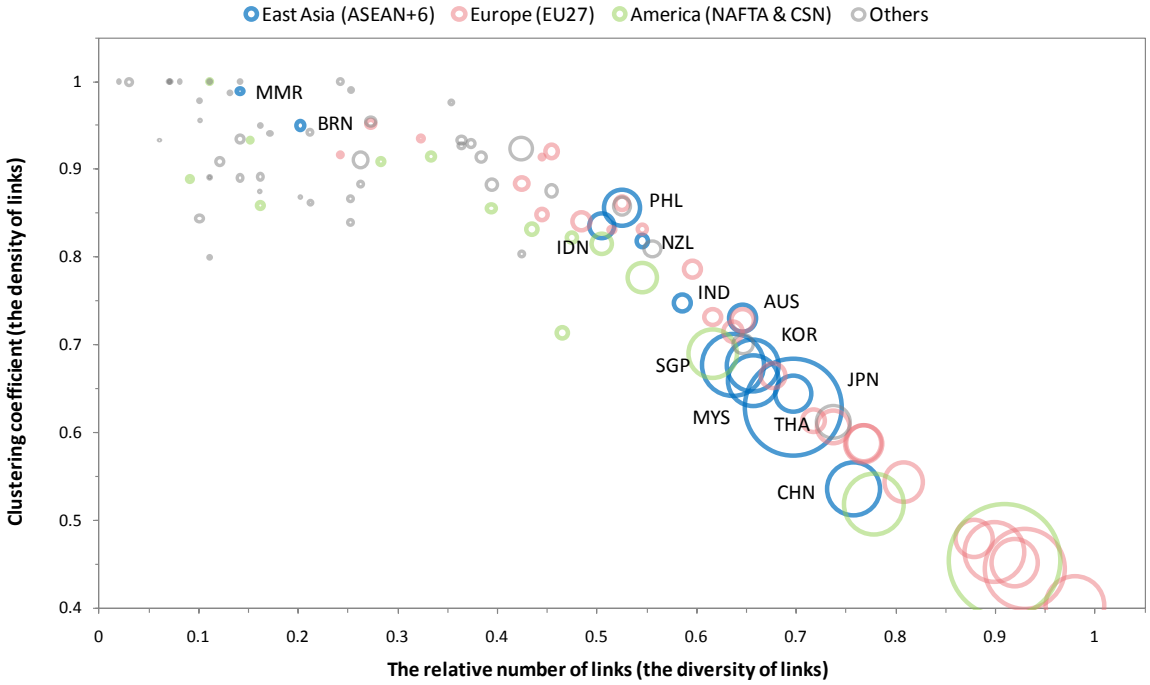
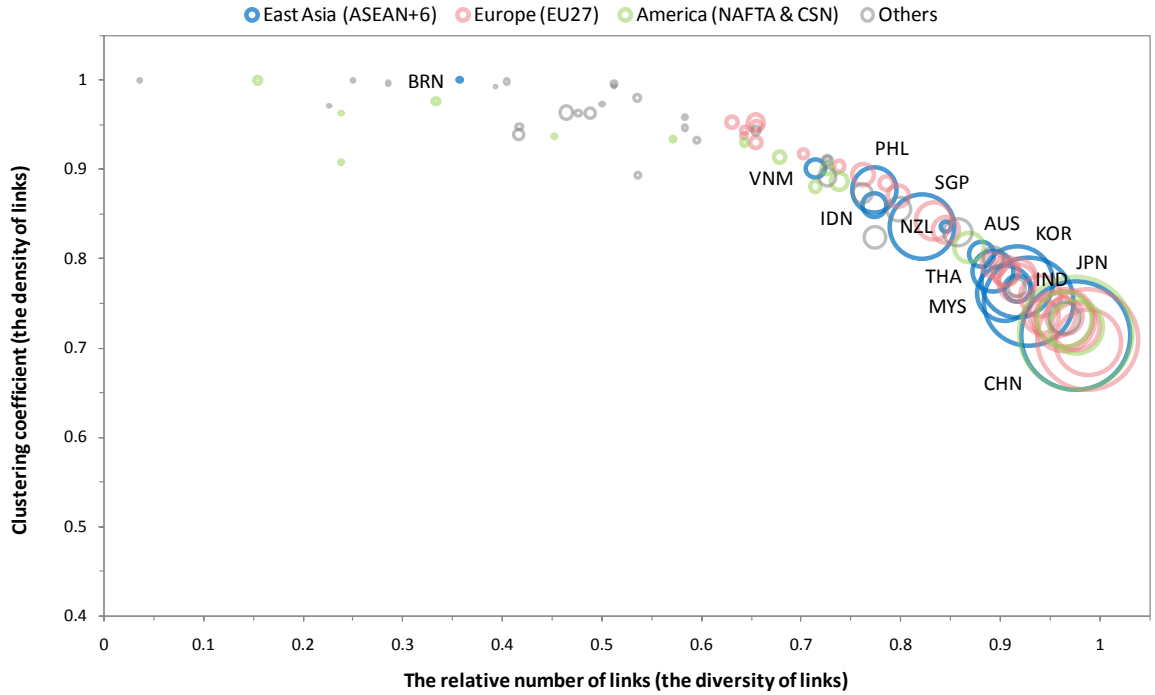


Figure 2-2. Inter-connectivity of international production networks in 2007

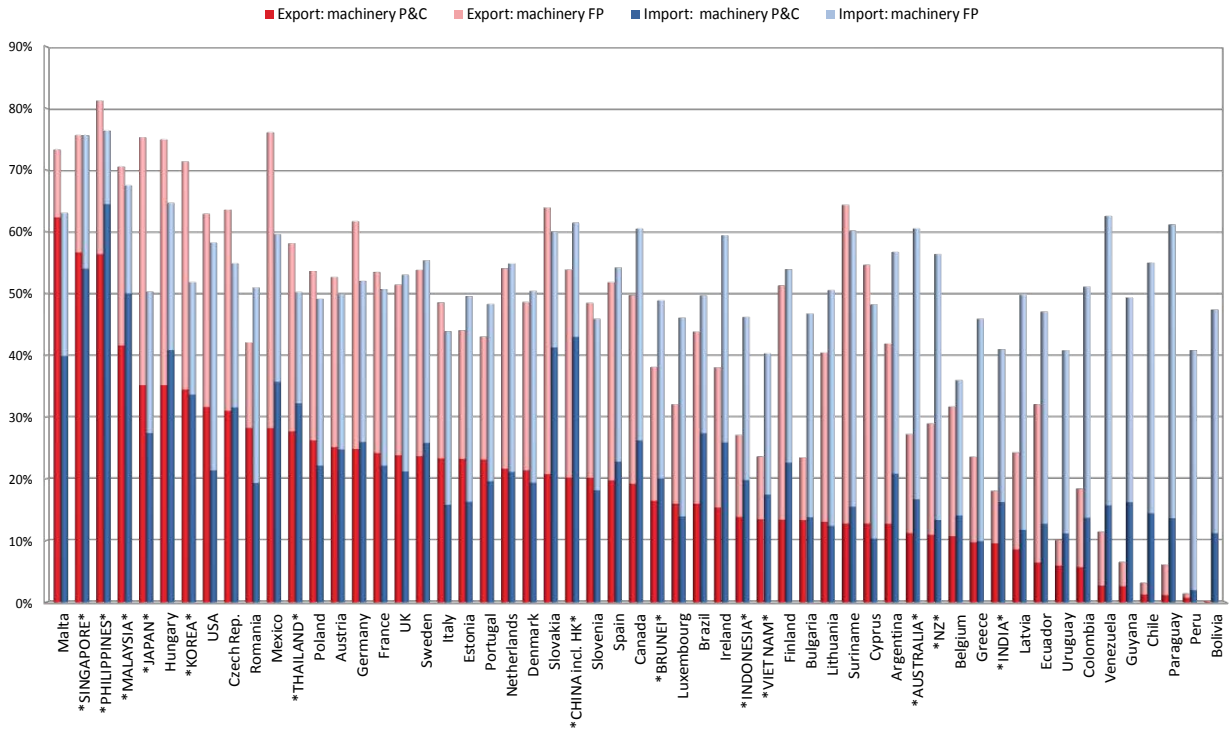


Note: "Links" are defined as two-way bilateral trade linkages for machinery parts & components, and "clustering coefficient" is the relative number of links among the partner countries that a country of interest actually has links with.
Source: Kimura and Obashi (2010).

2-1-2. Who is active in international production networks?

Figure 2-3 presents the proportion of machineries in total exports and imports of manufactured goods with the world for East Asian countries (ASEAN+6), European countries (EU27), and American countries (NAFTA) and CSN). Red stacked bars indicate the percentage of machineries in total manufactured goods exports, and the blue bars do the same for the import side. For both the red and blue bars, dark-colored portions represent machinery parts and components, and the light-colored portions denote machinery finished products. The bars are in the descending order of the percentage of machinery parts and components in total manufactured goods exports, from the left to the right. The percentage of machineries in exports indicates the extent to which a country is involved in international production networks while the percentage for the import side does not differ much across countries regardless of their degree of involvement. In particular, the percentages accounted for by exports and imports of machinery parts and components reflect active back and forth transactions in intermediate goods and are good proxies for the degree of a country's participation in the networks.

Figure 2-3. Shares of machineries in total exports/imports of manufactured goods to/from the world in 2007



Source: Kimura and Obashi (2010).

In the cases of Singapore, the Philippines, Malaysia, Japan, Korea, and Thailand, the percentages of all machineries exceed 50%, and those of parts and components reach almost 30% or more for both the export and import sides, indicating their deep participation in international production networks. China (including Hong Kong) is also actively involved in networks, as indicated by the fact that more than half of both exports and imports of manufactured goods are accounted for by machineries. However, parts and components account for only 20% for the export side, but more than 40% for the import side, which suggests the role of China as a "factory for the world". In the cases of Indonesia and Viet Nam, the percentages of parts and components exports are much higher than most of the CSN member countries except Brazil, though the corresponding figures for the import side are not much different. Still, Indonesia, Viet Nam, Australia, New Zealand, and India seem to be far behind in their degree of participation in production networks, compared with other East Asian countries.[3]

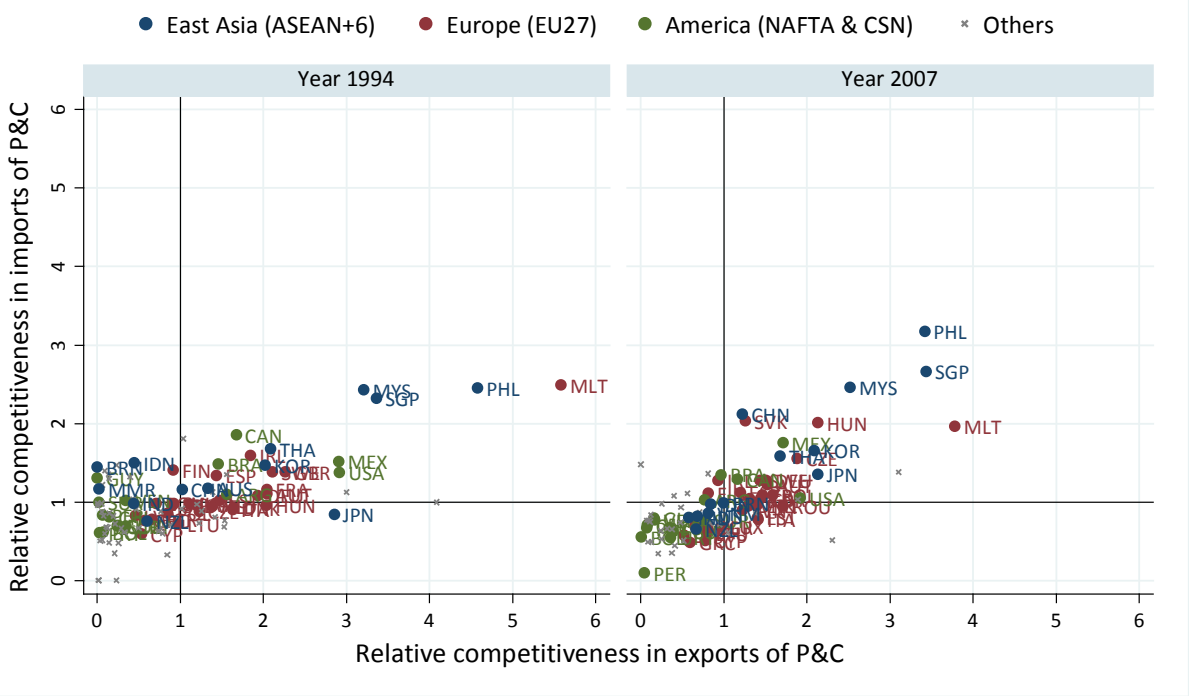
2-1-3. Export and import specialization in machinery parts and components

Figure 2-4 presents the degrees of specialization in exports and imports of machinery parts and components for respective countries in the world in 1994 and 2007. The horizontal axis indicates the international specialization index for exports of machinery parts and components, which ranges from 0 to the number of countries in the sample, i.e., 103 in 1994 and 85 in 2007, with a mean value of 1 as indicated by the solid line in the plot region. The vertical axis indicates the corresponding specialization index for the import side. The higher the international specialization index, the larger the proportion of machinery parts and components in total exports/imports of manufactured goods to/from the world, compared with other countries.[4] Points are plotted in different colors by regions: the blue colored circles for East Asian countries (ASEAN+6), red for European countries (EU27), green for American countries (NAFTA and CSN), and gray for others in the world.

[3] For a comparison between East Asia and other parts of the world, including the US-Mexico nexus and the Western-Eastern Europe connection, see Kimura and Ando (2003), Ando and Kimura (2007), and Kimura, Takahashi, and Hayakawa (2007).

[4] Export- and import based international specialization indices are calculated, following Amador, Cabral, Maria (2007) and Amador and Cabral (2009), as an alternative to the Balassa (1965)'s RCA index. In order to conduct a cross-country comparison of export/import competitiveness in a given sector, or the degree of specialization in exports/imports in the sector compared to other countries, Amador et al. (2007) and Amador and Cabral (2009) suggest employing the following index: $B_{ij}^{*} = (x_{ij} / X_i) / (\sum(x_{ij} / X_i) / N)$, which is the relative proportion of sector/product j in total exports/imports by country i compared to the average proportion among N countries in the sample. This alternative index has fixed lower and upper bounds across countries and time, given by 0 and N, and its mean is always equal to 1. Such proper cardinal properties across countries in a given sector make the index suitable for a cross-country comparison, especially over time.

Figure 2.4. Specialization patterns by region: Total exports/imports of parts and components to the world



Note: The international specialization index is defined as the relative proportion of machinery parts and components in total exports/imports of manufactured goods to/from the world compared with the average proportion among countries in sample.
Source: Kimura and Obashi (2010).

As of 1994, the Philippines, Singapore, and Malaysia already had remarkably high levels of specialization in both exports and imports of machinery parts and components. Malta was at the highest level for the export side, but the level of specialization for the import side is not much different from the above three East Asian countries. In 2007, the Philippines, Singapore, and Malaysia remain high for both export and import sides and moved to a higher level for the import side. Among European countries, not only Malta but Hungary also achieved a high level of specialization for both export and import sides. As of 2007, Korea, Thailand, Japan, and China are also located in the Northeast, meaning that they have high levels of specialization compared with other countries. Brunei, Indonesia, Viet Nam, Australia, New Zealand, and India still seem to be far behind, compared with other East Asian countries. However, East Asia as a whole is obviously most advanced in back-and-forth transactions of machinery parts and components.

2-2. Spatial structure of production networks

2-2-1. Evolutionary process of formation of production networks in East Asia

East Asia as a forerunner in developing international production networks has evolved its spatial structure of production networks since the late 1980s. In the 1990s, intra-regional production networks were constructed. After overcoming the Asian currency crisis and an IT bubble burst, intra-regional production networks enhanced their competitiveness together with rapid expansion of regional markets.

Table 2-1. Export structure of East Asian countries

(a) By-destination shares and annual average growth rates

	1994	1997	2001	2007	1994-1997	1997-2001	2001-2007
Within East Asia	43.6%	45.3%	43.5%	45.1%	5.6%	-0.9%	14.2%
United States	30.2%	28.1%	29.0%	22.6%	1.8%	1.0%	8.9%
European Union	17.2%	17.5%	18.0%	18.4%	4.9%	0.8%	14.0%
Others	9.0%	9.1%	9.5%	13.8%	4.4%	1.3%	20.9%
Total	100.0%	100.0%	100.0%	100.0%	4.3%	0.1%	13.5%

(b) By-commodity shares and annual average growth rates

	1994	1997	2001	2007	1994-1997	1997-2001	2001-2007
Machinery parts and components	24.0%	24.7%	25.8%	24.3%	5.3%	1.2%	12.4%
Machinery finished products	29.5%	28.1%	27.2%	26.4%	2.6%	-0.6%	13.0%
Other manufactured goods	31.4%	31.2%	30.6%	32.2%	4.0%	-0.3%	14.5%
Non-manufactured goods	15.1%	16.0%	16.3%	17.1%	6.3%	0.6%	14.4%
Total	100.0%	100.0%	100.0%	100.0%	4.3%	0.1%	13.5%

East Asia includes ASEAN10, Japan, Korea, China, Australia, New Zealand, and India.

Annual average growth rates are caluculated by using export data deflated by the US CPI (2005 basis).

Data source: UN Comtrade.

Table 2-1 presents changes in the export structure of East Asian countries. The period of 1994-1997 was the era when intra-East Asian production networks were initiated. Intra-regional export shares reached above 40%, and exports of machinery parts and components occupied about a quarter of the export total. The period of 1997-2001 was a stagnant period in which export growth became slow due to the Asian currency crisis and the bursting of the IT bubble. The period of 2001-2007 was an era with explosively expanding exports.

In the 2001-2007 period, exports within East Asia increased a little faster than exports to the rest of the world. Intra-regional exports mean intra-regional imports.

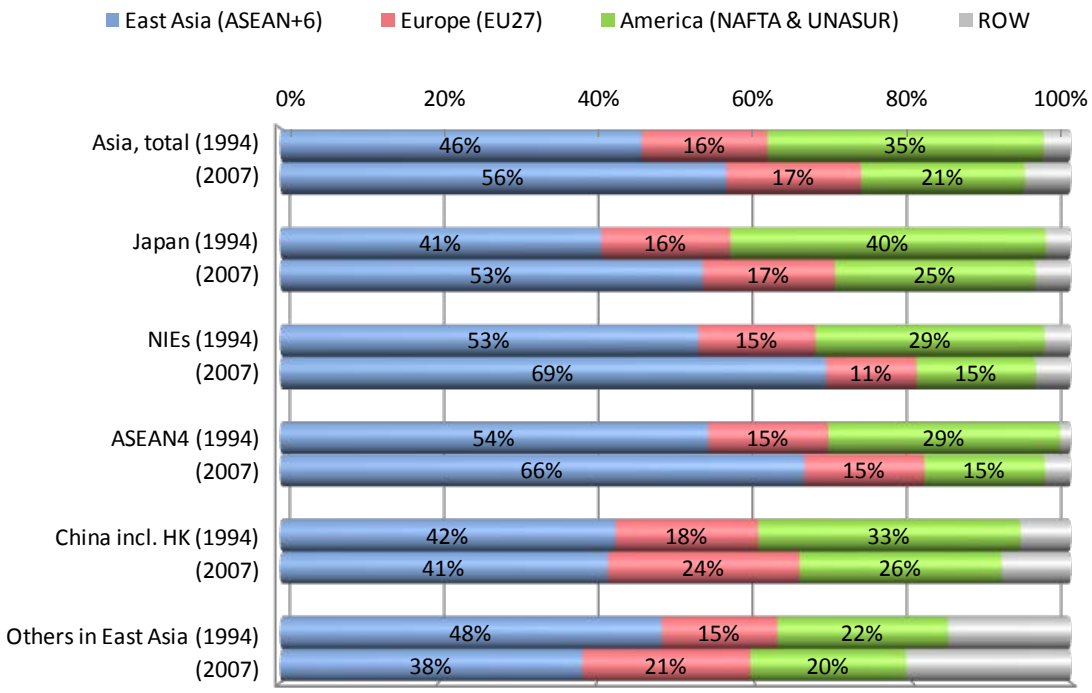
East Asian countries actually enhanced intra-regional trade openness, not only for machinery parts and components but also for other manufactured and non-manufactured goods. Vigorous growth of regional trade was due to trade liberalization, particularly through AFTA and China's WTO accession, reshuffling of production sites to pursue plant-level economies of scale, and the growth of middle-income population replacing people below the poverty line.

It is sometimes claimed that East Asian countries depend largely on countries outside the region, especially the US, as an ultimate source of demand for their exports of machineries. However, the importance of intra-regional trade has been rather rising or, at least, has remained unchanged since 2001. The share of the US market as an export destination has steadily reduced. Export markets outside East Asia have been diversified due to the enhanced international competitiveness of East Asian products.

2-2-2. Commodity composition and trading partners in international trade

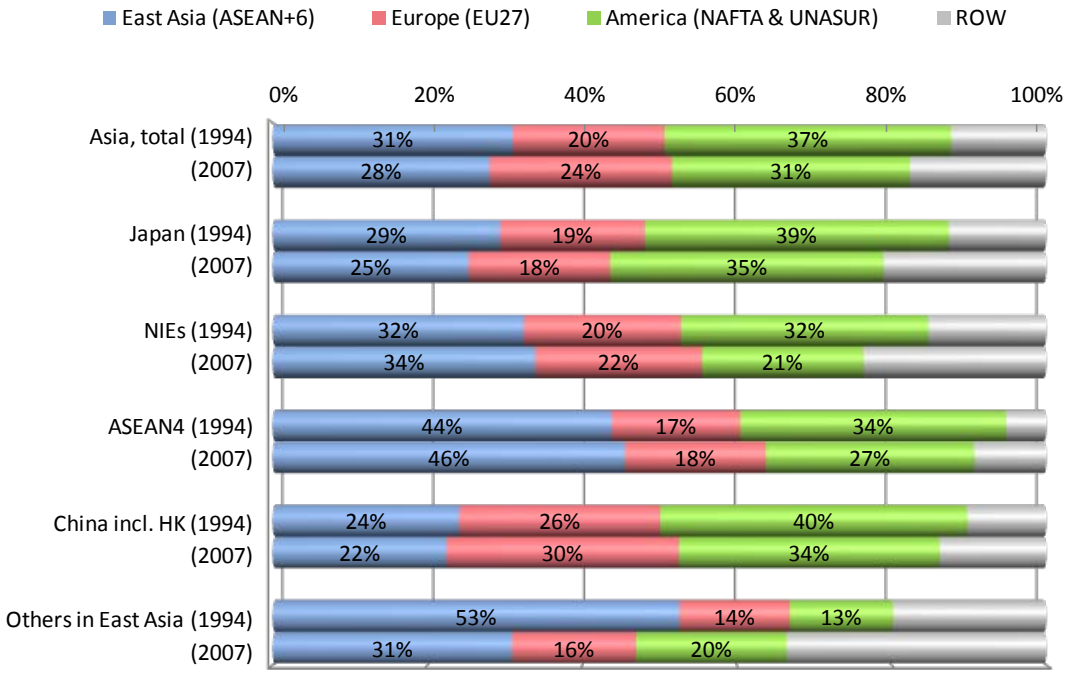
Figure 2-5 shows the composition of East Asia's exports of machinery parts and components by export destination. East Asia is divided into five subgroups, i.e., Japan, the newly industrialized economies (NIEs), the ASEAN4 (Indonesia, Malaysia, the Philippines, and Thailand), China (including Hong Kong), and others. The blue portions represent intra-regional exports within East Asia, the red portions represent exports to Europe, the green portions exports to America, and the gray portions show exports to the rest of the world (ROW). The percentages by destination are reported for two points in time, in 1994 and 2007. Japan, the NIEs, and the ASEAN4 increased their proportions of intra-regional exports from 1994 to 2007. In particular, for exports of machinery parts and components by NIEs and ASEAN4, intra-regional exports are of considerable importance, as indicated by the proportions of nearly 70%. Although the proportion of intra-regional exports remained mostly unchanged in the case of China and decreased by 10% points in the case of others in East Asia, the proportions of intra-regional exports still stand at about 40% or more. More interestingly, the proportion of exports to the US is uniformly decreasing over time across the five subgroups, particularly for the NIEs and the ASEAN4.

Figure 2-5. Shares by destination: East Asia's exports of machinery parts & components in 1994 and 2007



Source: Kimura and Obashi (2010).

Figure 2-6. Shares by destination: East Asia's exports of machinery finished products in 1994 and 2007

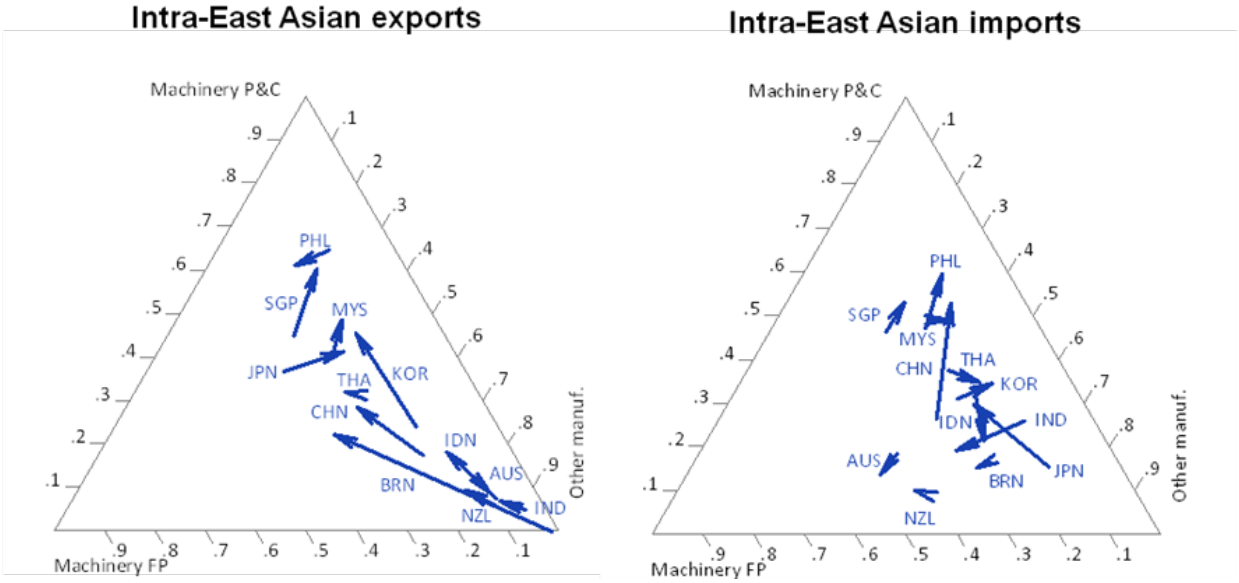


Source: Kimura and Obashi (2010).

Figure 2-6 presents the composition of the exports of machinery finished products by export destinations for the five subgroups of East Asian countries. The proportions of intra-regional exports are smaller for exports of machinery finished products than for parts and components. However, intra-regional transactions account for more than 40% and 30% of the exports of machinery finished products for the NIEs and the ASEAN4, respectively. Other economies in East Asia experienced a slight decline in the percentage of intra-regional exports from 1994 to 2007, though the relative importance of intra-regional transactions remain mostly unchanged. As in the case of exports of machinery parts and components, there is no evidence that East Asian countries increased their dependence on the US as an ultimate source of demand. Rather, East Asian countries seemed to diversify their export destinations, as indicated by the increasing proportions of exports to the rest of the world (ROW).

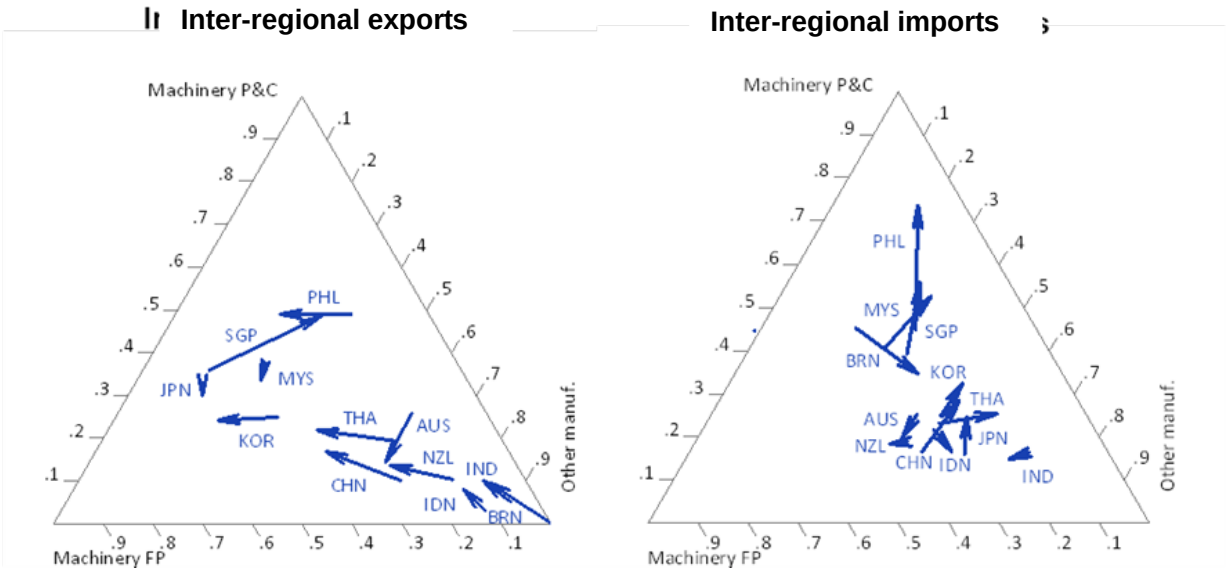
An unusually large proportion of East Asia's manufactured goods exports/imports is accounted for by machinery parts and components. This fact can be further examined by applying the method of triangular display by Leamer (1987) (Figures 2-7 and 2-8). The coordinate point in the triangle represents a country's product composition, i.e., proportions of machinery parts and components, finished products, and other manufactured goods. Each vertex represents a product composition that exports/imports of manufactured goods consist of that type of product. The midpoint indicates that the proportions of each of three types of products are equally 33.3%. In order to compare changes in product composition from 1994 to 2007 between East Asian countries, the changes of product composition between 1994 and 2007 are indicated using arrows. The product composition changes in the direction of an arrow from 1994 to 2007, to the extent indicated by the length of the arrow. The triangles are drawn for intra-regional exports and imports in Figure 2-7 and for inter-regional exports and imports in Figure 2-8.

Figure 2-7. Product composition of East Asia's intra-regional trade in manufacturing goods: Changes in 1994 to 2007.



Source: Kimura and Obashi (2010).

Figure 2-8. Product composition of East Asia's inter-regional trade in manufacturing goods: Changes in 1994 to 2007.



Source: Kimura and Obashi (2010).

As for intra-regional exports, most East Asian countries, except Japan and the Philippines, experienced increases in the proportion of machineries, especially parts and components, as indicated by arrows pointing to the upper left. Compared to their

export performance, East Asian countries experienced relatively small changes in the product composition of intra-regional imports. An exception is the case of China, whose arrow pointing upward is remarkably long. Also, in the case of Japan an increase in the proportion of machineries was biased toward parts and components.

It is noteworthy that directions of arrows are obviously different between intra-regional and inter-regional exports. Although most East Asian countries experienced increases in the proportion of machineries in both intra-regional and inter-regional exports, the increases are biased toward parts and components in intra-regional exports while they are skewed relatively toward finished products in inter-regional exports. An exception is the case of Singapore, whose long arrow points to the upper right in inter-regional exports, indicating a decrease in the proportion of machinery finished products along with simultaneous increases in the proportions of parts and components.

2-2-3. Geographical layers of transactions in production networks

In the mechanics of production networks, service link costs are sensitive to geographical distance, which is crucially important for constructing a spatial development plan. In particular, not only service link costs for fragmentation along the geographical distance but also those for fragmentation along the disintegration dimension, in other words intra-firm transaction costs, are highly sensitive to geographical distance. This observation provides the economic logic for the geographical structure of production networks.

Ando and Kimura (2009) present statistical evidence from transactions by Japanese MNEs. They find that long distance transactions such as those between Japan and ASEAN countries are predominantly intra-firm transactions. On the other hand, transactions within host countries by Japanese subsidiaries in developing East Asia are mostly arm's length. Transactions in the middle distance such as transactions among ASEAN countries are half intra-firm and half arm's length.

Although it is not at all easy to statistically capture the structure of intra-firm and arm's length (i.e., inter-firm) transactions, a typical machinery manufacturing firm seems to stratify its transactions in four layers in terms of gate-to-gate lead time and the frequency of delivery (Table 2-2).[5]

[5] More detailed discussion on the four layers of transactions in production networks is found in Kimura (2009a).

Table 2-2. Four layers of transactions in production/distribution networks

	1st layer (local)	2nd layer (sub-regional)	3rd layer (regional)	4th layer (world)
Lead time	Less than 2.5 hours	1 to 7 days	1 to 2 weeks	2 weeks to 2 months
Frequency	Once or more per day	Once or more per week	Once a week	Once a week
Transport mode	Trucks	Trucks/ships/airplanes	Ships	Ships
Trip length	Less than 100km	Less than 1,500km	Less than 6,000km	Longer

Source: Kimura (2008).

The first layer covers transactions with gate-to-gate lead time of less than 2.5 hours and delivery frequency of once or more per day. Most of such transactions are handled by trucks and are arm's-length. The geographical area of such transactions corresponds to what we call "industrial agglomeration" in which tight just-in-time systems with frequent deliveries and monitoring are operated.[6] Transactions with business partners that are new, small, and are not 100% trusted are mostly conducted within this geographical boundary.

The second layer consists of transactions with lead time of 1 to 7 days and delivery frequency of once or more per week. Transport modes vary; they can be trucks, ships, or airplanes. In cases of intra-firm transactions, the second layer covers transactions between plants owned by the same multinationals. In cases of arm's-length transactions, parts and components with modular interfaces occupy a large proportion of the trade; modules for computers and transactions with EMS firms are typical examples. Some transactions have integral-type interface; in such cases, parts and components producers often have high reputation and negotiating power so that they do not need to follow any request for relocation from the downstream firms. In addition, plant-level economies of scale are sometimes crucial in this type of transactions.

The third layer includes transactions with lead time of 1 to 2 weeks and typical delivery frequency of once a week. The corresponding geographical area covers the whole East Asia; transactions between Japan and China/ASEAN fall into this category. Because transactions are allowed some flexibility in their delivery timing, marine transportation is the major mode. Air transportation is utilized as a supplement in case of urgency. Intra-firm transactions between parent firms and affiliates are included in this layer.

[6] Machikita and Ueki (2010a, 2010b) provide empirical evidence on the geographical extension of industrial agglomerations in ASEAN.

The fourth layer includes transactions covering the whole world. The lead time is typically 2 weeks to 2 months, and the frequency of delivery is, say, once per week. The predominant delivery mode is marine container transportation via regular shipping routes. Although rapid air transportation is sometimes used, the proportion is relatively small.

Major factors that affect which transaction layers are chosen are summarized in Table 2-3. Arrows in the table denote the typical extent of the choice of transaction layers, if other factors are set at an average level.

Table 2-3. Factors affecting transaction choices

	1st layer (local)	2nd layer (sub-regional)	3rd layer (regional)	4th layer (world)
Re: fragmentation along the distance axis				
Network set-up cost / relocation cost	small ←		→ large	
Service link cost (esp. transport cost (cost, lead time, quality))	large ←			→ small
Location advantages (esp. production conditions, economies of scale)	small ←		→ large	
Re: fragmentation along the disintegration axis				
Intimacy of inter-firm relationship				
Intra-firm vs. arm's-length (capital holdings)	arm's-length ←		→ intra-firm	
Credibility	weak ←		→ strong	
Power balance	unbalanced ←		→ balanced	
Architecture of inter-firm interface				
Modular vs. integral	integral ←		→ modular	

Source: Kimura (2008).

Turning to the economic logic in fragmentation along the distance axis, there are three kinds of costs to be considered: (i) network set-up cost or relocation cost, (ii) service link cost, and (iii) location advantages which save production cost *per se*. When the network set-up cost or relocation cost is small, it may be better to relocate production plants and carry out transactions over shorter distances, and vice versa. When the service link cost, including transport, is large, transactions over shorter distances are chosen, and vice versa. When differences in location advantages are large, long-distance transactions are permitted, and vice versa. When plant-level economies of scale are strong, long-distance transactions would be warranted.

In considering fragmentation along the disintegration axis, the relationship between transaction cost and geographical proximity is crucial. If the intimacy or level of trust between business partners is high, geographical distance in transactions can be

far, and vice versa. Therefore, arm's-length transactions are predominant in the 1st layer while intra-firm transactions occupy a large share in the 3rd layer. In cases of arm's-length transactions, when credibility is weak (strong), the 1st layer (2nd layer) is chosen. When the power balance between upstream and downstream firms is unbalanced, the 1st layer is chosen. When the power of upstream and downstream firms is balanced, the 2nd layer can be selected. In addition, the architecture of the inter-firm interface is important. When modular interface is selected, transactions can be in the 2nd layer or 3rd layer. On the other hand, when the interface is in total integration, the 1st layer is predominantly chosen.

2-3. Policy environment in East Asia

Why was East Asia able to start developing international production networks, well ahead of other developing areas in the world? One of the important factors was certainly a policy environment consistent with new development strategies. This was not, however, a well-planned move from the beginning.[7]

The period before the Asian currency crisis is characterized as competitive unilateral liberalization of trade and investment, and progressive improvement of the business environment. Major policy reform was initiated by Singapore, and then Malaysia and Thailand in the mid-1980s. In the midst of a serious recession, they decisively shifted their FDI-hosting policies from cautious and selective acceptance to aggressive attraction in most of the manufacturing sectors. Emerging China, under Deng Xiaoping's leadership, then further stimulated the competitive unilateral liberalization. Policymakers in these countries did not originally have a clear idea of the policy environment that would foster international production networks. However, by accumulating small unilateral reforms, and trouble shooting, responding to various requests by multinationals, a favorable environment for production networks gradually came into shape.

Trade liberalization, together with investment liberalization and facilitation, was substantial. In particular, tariffs imposed on machinery parts and components were reduced or completely removed, unilaterally, from the beginning of the 1990s, and such trade liberalization was further pursued under the initiative of the Information Technology Agreement (ITA) in the latter half of the 1990s. We here observe a "race to the bottom" type of trade liberalization (Baldwin, 2006) where developing countries

[7] More detailed discussion on policy environment is found in Kimura (2009b).

aggressively competed in attracting FDI and conducting trade liberalization. Consequences of the policy reform were the formation of extensive production networks in the electronics industry, including semiconductors, hard disk drives (HDD), other modules, and computers themselves.

It should however, be noted that trade protection was preserved for some key import-substituting industries dominated by national projects or import-substituting MNEs; such industries include automotive, electric appliances, iron and steel, petrochemicals, and others. The Asean Free Trade Area (AFTA) agreement was concluded in 1992 and started a liberalization process in 1993 at the same time as China began to emerge as a powerful attracter of FDI. It certainly played a symbolic role in advertising ASEAN's intention of stepping forward to trade and FDI liberalization. However, actual trade liberalization under the Common Effective Preferential Tariff (CEPT) scheme in AFTA moved very slowly before the Asian currency crisis.

The Asian currency crisis, starting from 1997, triggered a breakthrough in the policy environment of East Asia. By creating hardship for individual countries in East Asia, the Asian currency crisis nurtured the regional concept of East Asia, and Free Trade Agreements (FTAs) came to center stage. Ultimately an FTA hub-and-spoke system with ASEAN centrality has emerged (Table 2-4).

Table 2-4. FTA networking in extended East Asia

(As of November 2009)

	Japan	Korea	China	ASEAN	Brunei	Indonesia	Malaysia	Philippines	Singapore	Thailand	Vietnam	CLM	India	Australia	New Zealand
Japan		○ (suspended)	△	◎: 2008 -	◎: 2008	◎: 2008	◎: 2006	◎: 2008	◎: 2002	◎: 2007	◎		○	○	
Korea	○ (suspended)		△	◎: 2007 -					◎: 2006				◎	○	○
China	△	△		◎: 2005 -					◎: 2009				△	○	◎: 2008
ASEAN	◎: 2008 -	◎: 2007 -	◎: 2005 -	◎: 1993 -	(1992)	(1992)	(1992)	(1992)	(1992)	(1992)	(1995)	(LM:1997/C:1999)	◎	◎: 2010 -	◎: 2010 -
Brunei	◎: 2008			(1992)		(1992)	(1992)	(1992)	(1992)	(1992)	(1995)	(LM:1997/C:1999)			◎: 2006
Indonesia	◎: 2008			(1992)	(1992)		(1992)	(1992)	(1992)	(1992)	(1995)	(LM:1997/C:1999)		△	
Malaysia	◎: 2006			(1992)	(1992)	(1992)		(1992)	(1992)	(1992)	(1995)	(LM:1997/C:1999)	○	○	◎
Philippines	◎: 2008			(1992)	(1992)	(1992)	(1992)		(1992)	(1992)	(1995)	(LM:1997/C:1999)			
Singapore	◎: 2002	◎: 2006	◎: 2009	(1992)	(1992)	(1992)	(1992)	(1992)		(1992)	(1995)	(LM:1997/C:1999)	◎: 2005	◎: 2003	◎: 2001
Thailand	◎: 2007			(1992)	(1992)	(1992)	(1992)	(1992)	(1992)		(1995)	(LM:1997/C:1999)	△	◎: 2005	◎: 2005
Vietnam	◎			(1995)	(1995)	(1995)	(1995)	(1995)	(1995)	(1995)		(LM:1997/C:1999)			
CLM				(LM:1997/C:1999)	(LM:1997/C:1999)	(LM:1997/C:1999)	(LM:1997/C:1999)	(LM:1997/C:1999)	(LM:1997/C:1999)	(LM:1997/C:1999)	(LM:1997/C:1999)				
India	○	◎	△	◎			○		◎: 2005	△				△	△
Australia	○	○	○	◎: 2010 -		△	○		◎: 2003	◎: 2005			△		◎: 1983
New Zealand		○	◎: 2008	◎: 2010 -	◎: 2006		◎		◎: 2001	◎: 2005			△	◎: 1983	

Notes: ◎: signed or being effective, ○: under negotiation or agreed to negotiate, △: feasibility study or preparatory talks. The year indicates when the concerned FTA was in force. "-" after the year means that some ASEAN countries are under the corresponding FTAs in force and other countries follow later. Dark blue indicates FTAs signed before or in the 1990s, blue indicates FTAs signed in the first half of the 2000s, and light blue indicates FTAs signed in the second half of the 2000s. For some FTAs, their status in this table is based on the agreement of trade in goods; negotiations may be still ongoing over other areas such as investment and services even if the agreements are identified as those signed or being effective here. The year in parenthesis shows the year for the corresponding ASEAN country to be the member of ASEAN/AFTA.

Sources: Websites of trade ministries in each country and others including JETRO website (http://www.jetro.go.jp/world/).

FTAs create a better policy environment in two ways: restructuring import-substituting industries and further activating production networks.

The restructuring of import-substituting industries is inevitable in resolving inconsistency in trade policies. Network-forming industries prefer free trade regimes, while import-substituting industries call for trade protection. Before the Asian currency crisis, the conflict between these two was partially reconciled by Export Processing Zones (EPZs), duty-drawback systems, and other policy arrangements. However, once the Asian currency crisis started, ASEAN member countries were forced to propose and take more drastic measures in order to keep attracting FDI. There was of course resistance from companies and entrepreneurs who worked for national products, as well as import-substituting MNEs, and thus collective effort in the region was required to remove trade barriers from these industries. In this context, AFTA has been a particular success, and has become one of the "cleanest" FTAs in terms of the liberalization coverage for trade in goods.

The contents of FTAs, beyond tariff removal, work strongly to further activate production networks. The introduction of expanded policy modes to FTAs is a pragmatic response to large and small requests from the private sector wishing to extend international production networks. As a consequence, facilitation and cooperation are often emphasized more than liberalization.

The ASEAN Economic Community (AEC) initiative is an ambitious effort to extend the effort of AFTA to a wide range of policy modes. Various trade facilitation measures, including the national/ASEAN single window and other initiatives will have beneficial effects. Japanese bilateral FTAs with ASEAN were also specifically designed to favor production networks, and include trade facilitation such as customs procedures, the establishment of business-government dialogues, and economic and technical cooperation. A series of these small measures have been specifically designed to reflect the issues and requirements of MNEs operating production networks. The emphasis on investment liberalization and facilitation is another aspect of importance.

It should be noted that most of the measures of trade and investment facilitation would be applied on the Most Favored Nation (MFN) basis rather than the infamous discriminatory basis. In other words, firms of any nationality can enjoy the improvement in a policy environment brought about by FTAs. This is an important characteristic of competing FTAs in an open setting.

Some people may have a concern that overlapping bilateral/multilateral FTAs would cause confusion in trade regimes. This is the so-called "spaghetti bowl" or "noodle bowl" phenomenon. However, recent empirical observations reveal that trade

deterrence effects due to such confusion seem to be small while trade liberalization effects look positively significant, at least in ASEAN and East Asia. Rules of origin (RoO) are thought to generate complications, but the RoO system in East Asian FTAs is relatively trade-friendly, compared with FTAs in other parts of the world (Estevadeordal, Harris, and Suominen (2007)). Medalla and Balboa (2009) conduct a thorough survey on RoOs in ASEAN and ASEAN+1 FTAs and find that the co-equal system, i.e., providing multiple choices of RoO rules for traders (for example, traders can choose either the value added rule or the change-in-tariff-classification rule), seems to work as a simple and liberal RoO. Hayakawa, Hiratsuka, Shiino, and Sukegawa (2009) analyze the pattern of FTA utilization by Japanese firms and conclude that the complication of overlapping FTAs is not very serious though more facilitation is certainly called for.

2-4. Durability and resiliency of production networks

2-4-1. Are production networks footloose?

FDI is sometimes criticized as being footloose; MNEs do not commit deeply to local production, and slight changes in competitive conditions may easily cause local production plants to move. In the case of FDI in the context of production networks, however, production blocks tend to carry thin slices of value added, and such FDI might present an even stronger footloose character. However, this claim is not empirically warranted.

A series of empirical studies as well as the extended fragmentation theory have claimed quite the opposite. Transactions in production networks, particularly international trade in machinery parts and components, are much more stable than other types of transactions. The stability is due to the relation-specific nature of transactions compared with the spot-market, open-bidding type of transactions. To set up or restructure production networks, a firm has to pay a substantial amount of sunk cost in identifying location advantages and checking the strength of potential business partners, as well as in building up reliable links. Hence, once production networks are constructed, transactions become relation-specific and stable. Furthermore, as is presented below, production networks are resilient and elastic even against large macro shocks such as an Asian currency crisis or a global financial crisis.

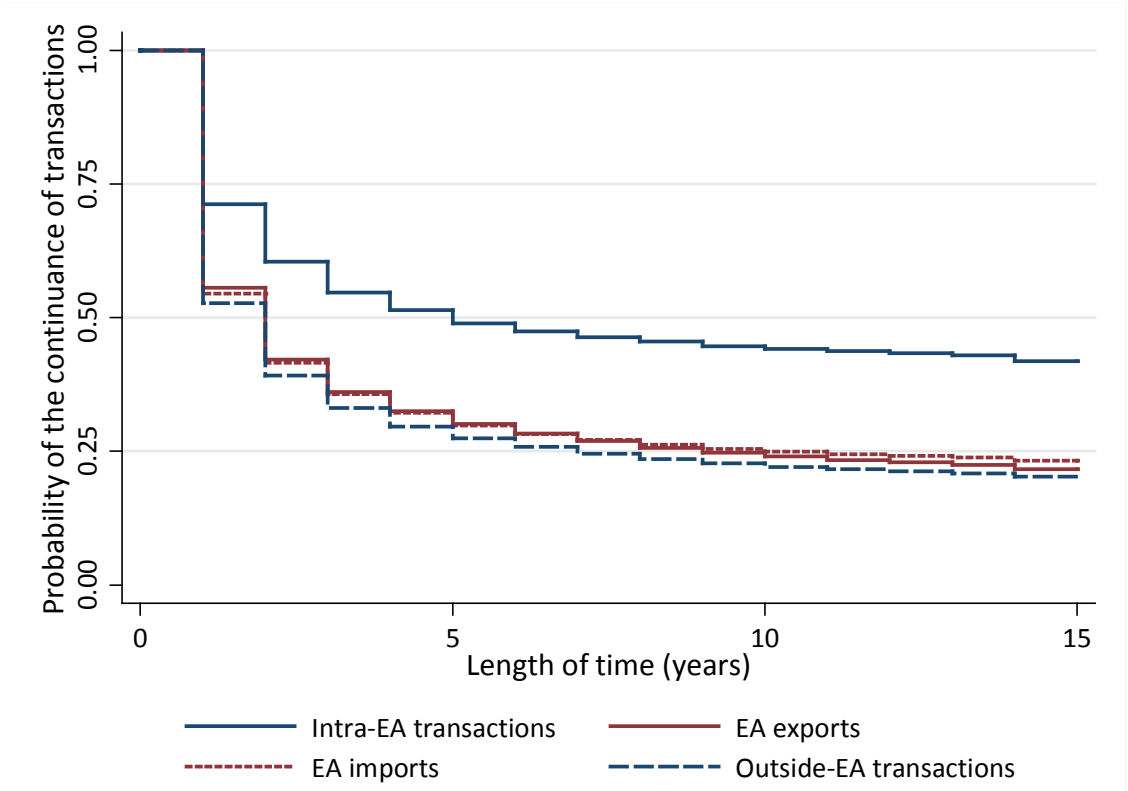
In the past, policies for hosting FDI have sometimes contained measures against the footloose behavior of MNEs. Such policy measures include requirements of thicker slices of value added and large local procurement of parts and components, and

even restriction on exit. These policy measures, however, are likely to affect the development of production networks adversely. Once production networks are developed and industrial agglomerations start to emerge, transactions are stabilized. Therefore, rather than restricting the footloose characteristics of MNEs, it seems better take advantage of the possible footloose moves of MNEs in order to attract a critical mass of FDI, and thereby promote the development of industrial agglomerations.

2-4-2. Evidence from survival analysis

At the detailed level of trade commodity classification, bilateral trade is quite often interrupted year by year. Obashi (2010a) applies the method of survival analysis to intra-East-Asian trade and proves that trade in machinery parts and components is longer-lived and more stable than trade in machinery finished products. Trade relationships in machinery parts and components are more likely to be maintained between countries even at a long distance, regardless of exchange-rate fluctuations. The probability of discontinuing trade relationships of machinery finished products is more likely to be sensitive to the level of trade cost as well as exchange-rate fluctuations.

Figure 2.9. Stability of East Asian Production Networks



Source: Obashi (2010).

Figure 2-9 presents further results (Obashi, 2010b). Even in bilateral trade in machinery parts and components, transactions within East Asia are longer-lived and more stable than transactions with outsiders. East Asian countries are more likely to engage in long-lived trade relationships in machinery parts and components with each other than with outsiders, as well as compared to outside the region, unlike the case of finished products. Moreover, Obashi (2009) conducts a detailed analysis on the period of the Asian currency crisis and finds the resiliency of production networks even against negative macro shocks.[8]

2-4-3. Trough and rebound in the global financial crisis

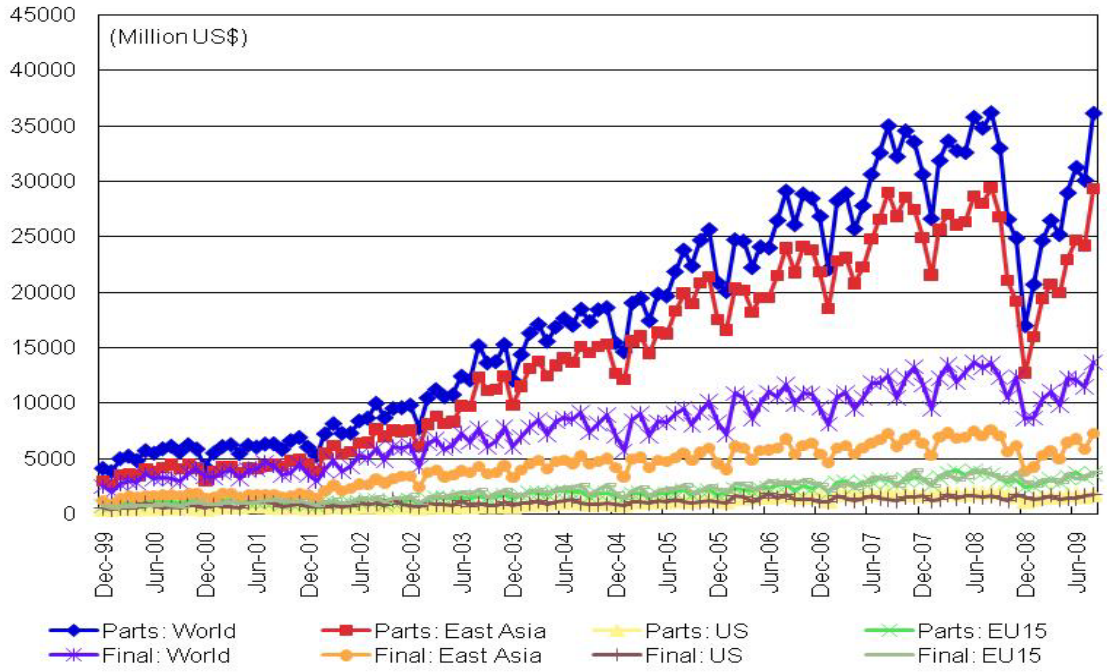
In the current global financial crisis, massive negative shocks came from the US and Europe to East Asia through both trade and financial channels. In particular, international production networks became one of the major transmission lines of negative shocks, and transactions within international production networks drastically declined. However, we observe that the rebound of regional trade was also quick and strong after passing through a deep trough.

Figure 2-10 (a)-(h) presents monthly exports and imports of machinery parts and components as well as machinery finished products by China, the ASEAN4 (Malaysia, Thailand, Indonesia, and the Philippines), the NIEs4 (Korea, Taiwan, Hong Kong, and Singapore), and Japan (Ando, 2010b). From 2001 to September 2008, both exports and imports grew strongly in most of the countries. Then came the Lehman shock, and trade shrank drastically. With the trough bottomed in around February 2009, exports and imports rebounded.

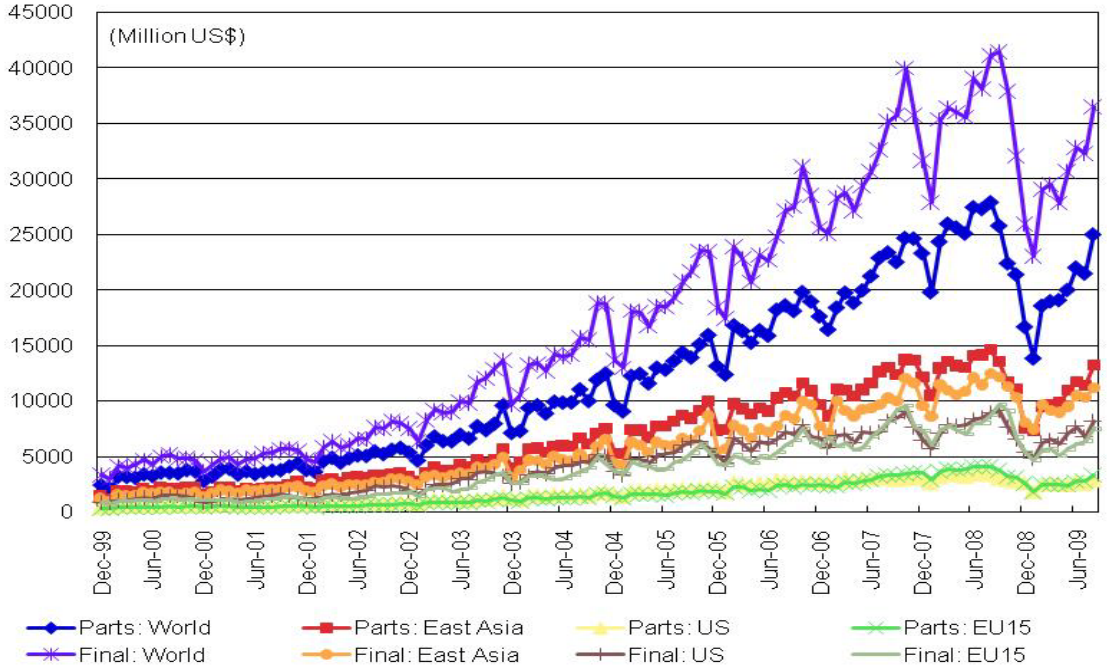
[8] Ando and Iriyama (2009) conduct a micro-data analysis of exports and imports by Japanese manufacturing firms in 1994-2004 and find that Japanese manufacturing firms, particularly machinery firms, with greater foreign operations under their own corporate control would better absorb shocks of exchange rate fluctuations by adjusting intra-firm transactions more significantly than others. Relation-specific transactions in production networks can also work as shock absorbers.

Figure 2-10. Monthly exports and imports of machinery parts & components, and machinery finished products

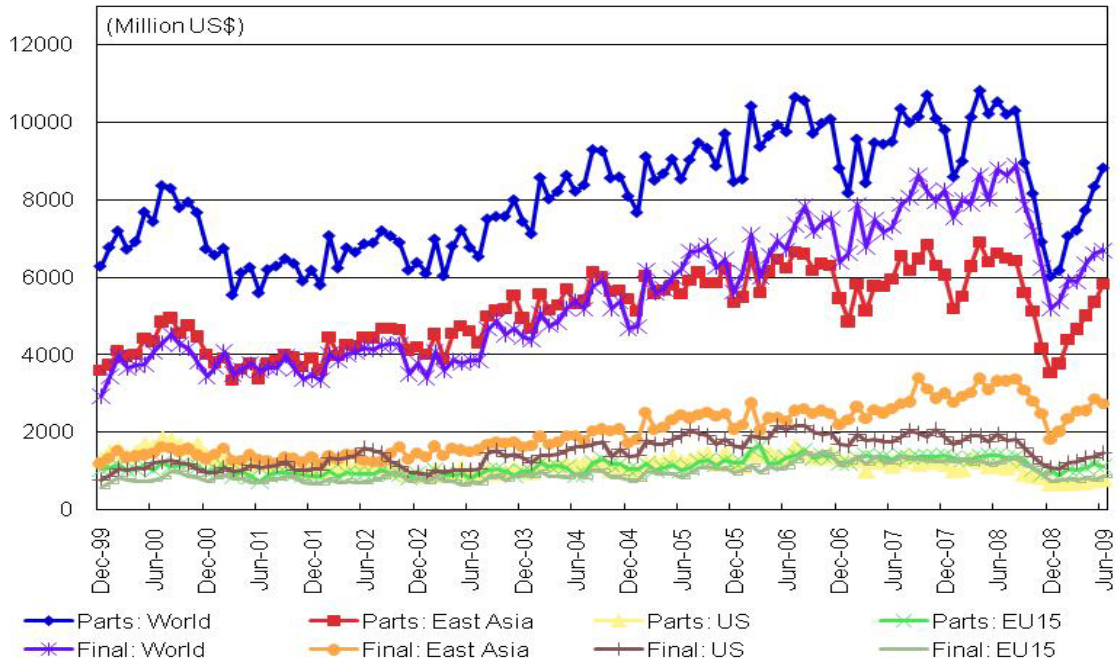
(a) Machinery Exports: China



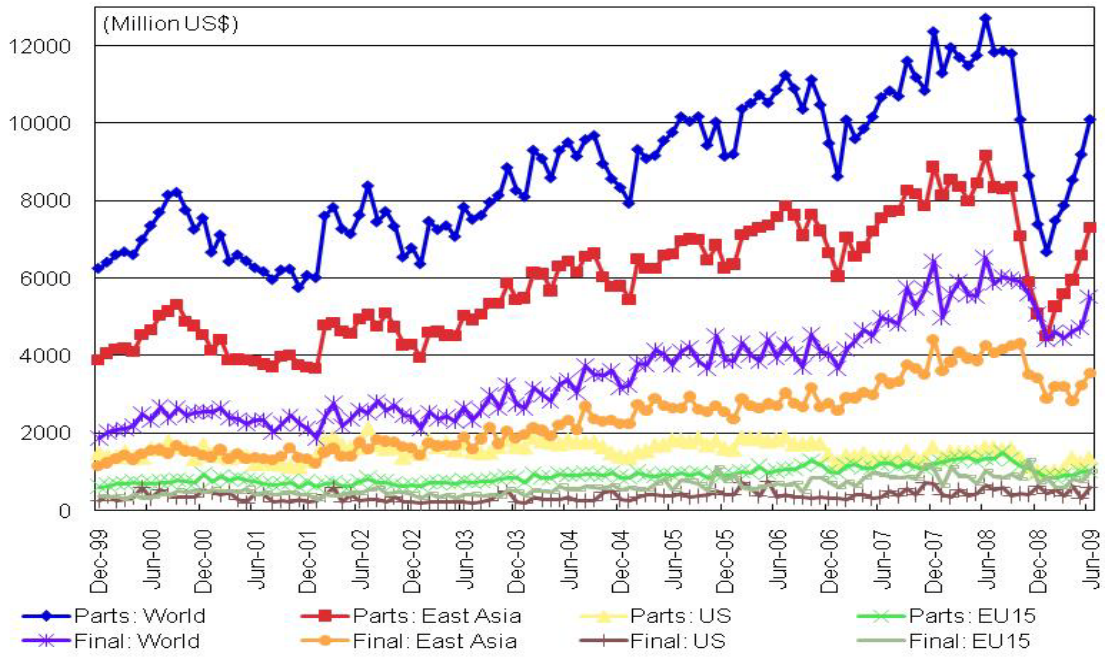
(b) Machinery Imports: China



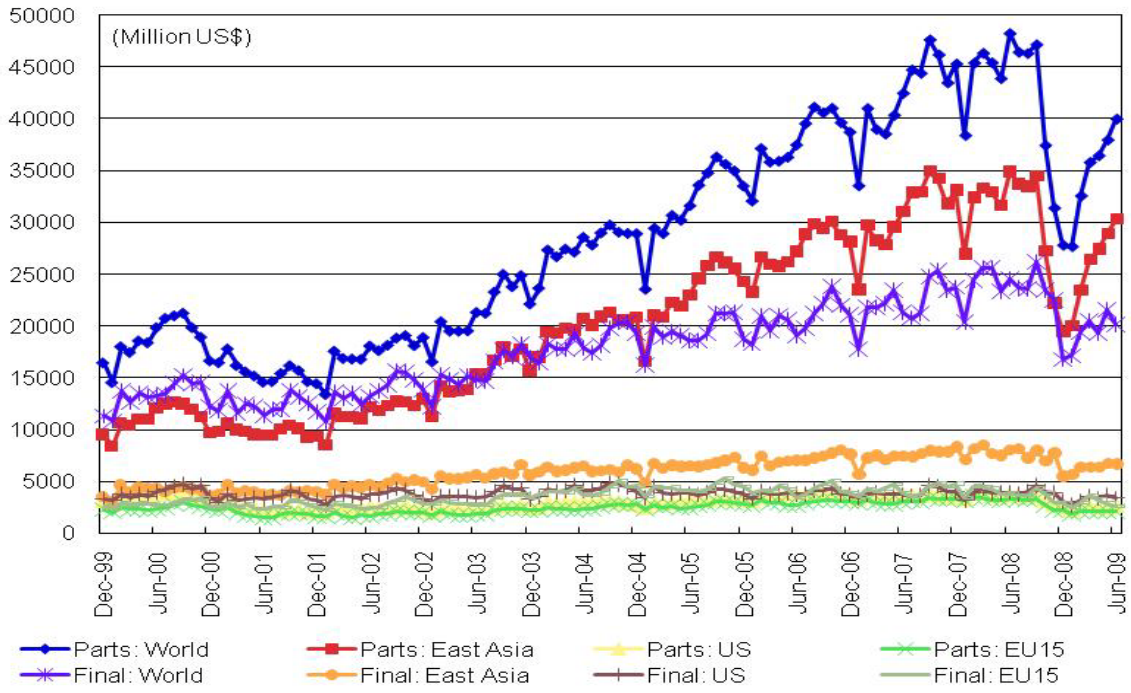
(c) Machinery Exports: ASEAN4



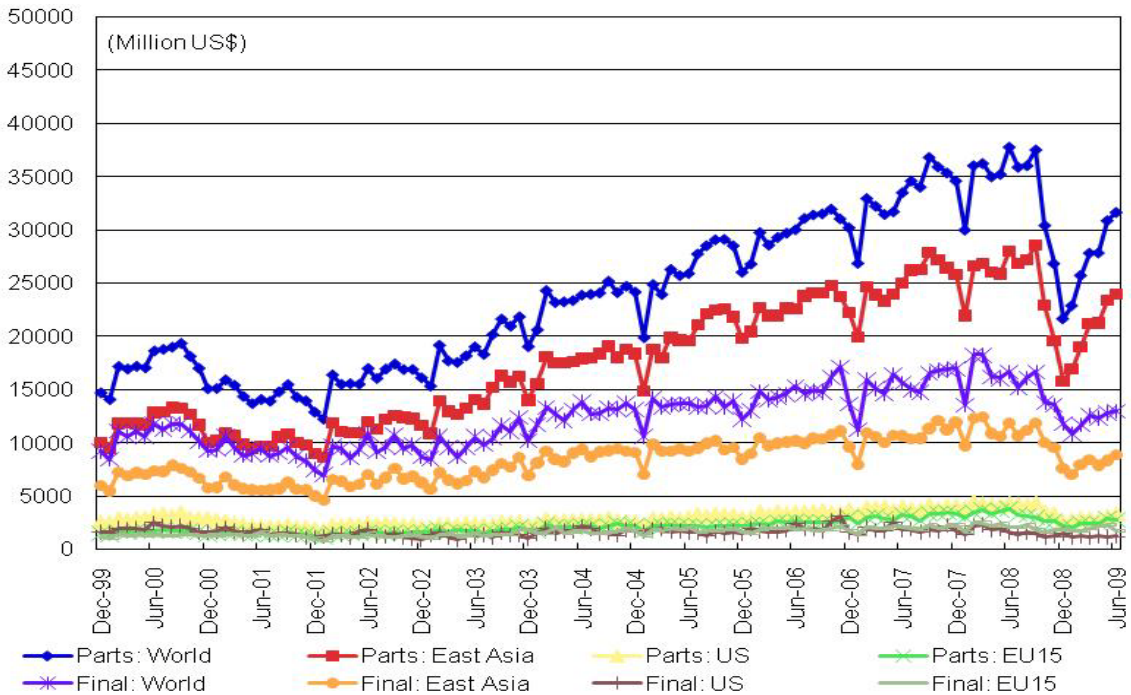
(d) Machinery Imports: ASEAN4



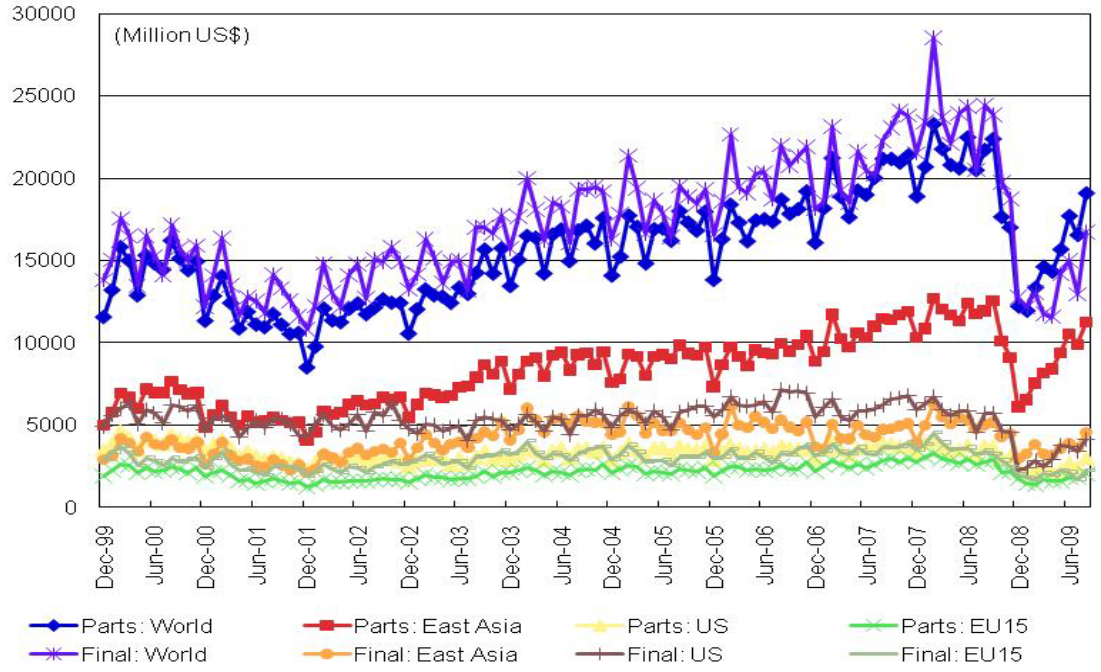
(e) Machinery Exports: NIEs4



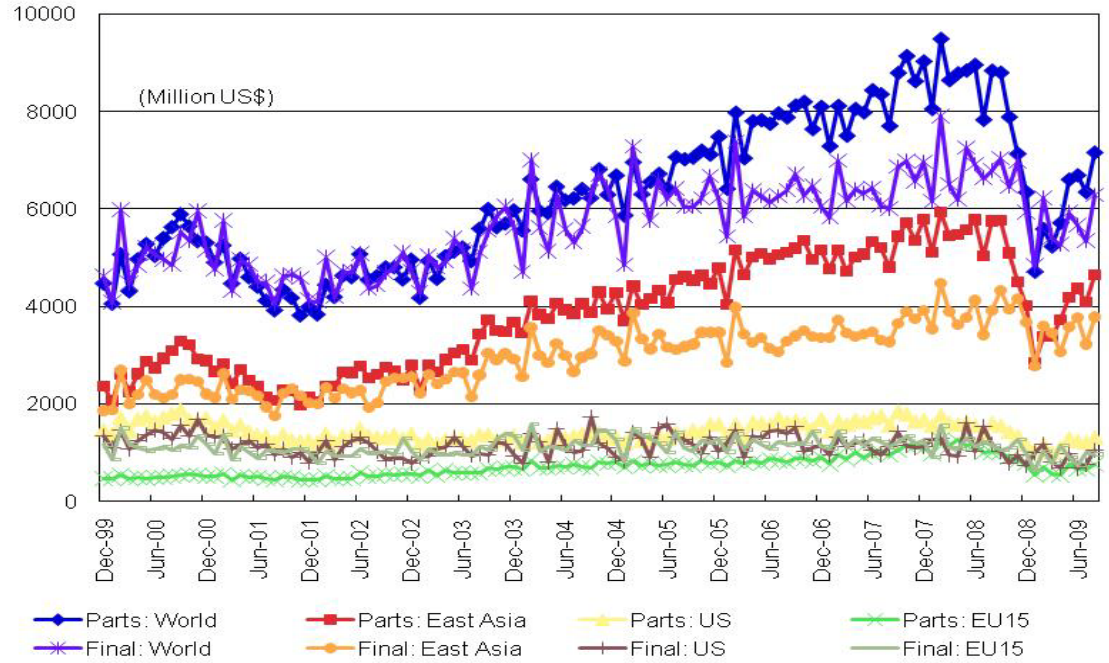
(f) Machinery Imports: NIEs4



(g) Machinery Exports: Japan



(h) Machinery Imports: Japan



Source: Ando (2010b).

Table 2-5 summarizes trough and rebound indices calculated by setting the trade values in September 2008 at 100. The troughs are typically in February 2009, and recovery started after that.[9] The troughs are certainly deep; trade values go down by 30-50%, particularly on the export side. The recovery is quick and strong, however. Some would have expected that troughs for machinery parts and components would be deeper than those for machinery finished products, due to the magnification effect in parts and components trade.[10] However, such an effect does not seem to be strong; the depth of troughs and the speed of rebounds do not look much different between trade in machinery parts and components and trade in machinery finished products.

Table 2-5. Trade index for machinery trade in East Asia (2008.9=100)

			China			ASEAN4		NIES4		Japan		
			2009.2	2009.7	2009.9	2009.2	2009.7	2009.2	2009.7	2009.2	2009.7	2009.9
(a) Machinery (HS84-92)												
EX	Parts	World	50	79	90	60	86	60	86	55	82	88
	Parts	East Asia	51	80	91	59	91	60	91	55	88	94
	Parts	US	54	82	85	57	67	61	76	54	72	80
	Parts	EU15	43	67	81	64	80	58	66	52	65	73
	Final	World	56	80	89	61	75	73	86	50	61	68
	Final	East Asia	60	84	90	60	81	79	92	64	78	90
	Final	US	54	86	92	58	80	67	83	42	65	72
	Final	EU15	53	70	86	58	65	66	70	52	62	64
IM	Parts	World	57	86	100	56	85	63	88	53	76	81
	Parts	East Asia	54	84	100	54	88	62	88	49	76	81
	Parts	US	69	91	92	63	87	66	80	64	77	82
	Parts	EU15	69	102	102	58	68	66	87	54	65	75
	Final	World	64	89	101	73	91	67	81	71	84	93
	Final	East Asia	56	89	96	69	85	63	80	71	97	97
	Final	US	80	85	107	72	99	73	76	85	58	90
	Final	EU15	73	90	106	101	119	75	75	57	66	84

Source: Ando (2010b).

Table 2-6 presents contribution ratios during the downturn and upturn by trading partners. Trade shares by trading partners before the Lehmann shock are also tabulated. In the downturns from September 2008 to February 2009, contribution ratios in exports by trading partners are about the same as the export shares, which means that intra-regional and inter-regional exports shrank almost equally. Note that

[9] Most of the bilateral trade has a seasonal pattern with a peak in August-September and a trough in February. Such "normal" seasonality at least partially contributed to the ups-and-downs in 2008-2009.

[10] For the magnification effect in parts and components trade, see Yi (2003).

direct effects of the decline is US demand are not huge, even in the case of exports of machinery finished products. On the other hand, in the upturn from February 2009 to July 2009, intra-regional exports typically have more than proportional contribution to the recovery of exports.

Table 2-6. Contribution of each region to changes in machinery trade in East Asia

			China			ASEAN4			NIEs4			Japan		
			Share in world trade (2007.10-2008.9)	Drop (2008.9 - 2009.2) Contribution ratio	Recover (2009.2 - 2009.7) Contribution ratio	Share in world trade (2007.10-2008.9)	Drop (2008.9 - 2009.2) Contribution ratio	Recover (2009.2 - 2009.7) Contribution ratio	Share in world trade (2007.10-2008.9)	Drop (2008.9 - 2009.2) Contribution ratio	Recover (2009.2 - 2009.7) Contribution ratio	Share in world trade (2007.10-2008.9)	Drop (2008.9 - 2009.2) Contribution ratio	Recover (2009.2 - 2009.7) Contribution ratio
(a) Machinery (HS84-92)														
EX	Parts	East Asia	52.7	51.1	53.2	62.6	64.6	77.7	72.4	72.3	83.6	55.1	54.9	69.2
	Parts	US	12.6	10.8	11.3	11.7	12.4	4.3	8.1	7.4	4.2	17.3	17.6	11.5
	Parts	EU15	14.7	16.6	12.0	13.5	12.1	8.7	7.4	7.3	2.1	13.7	13.7	6.1
	Final	East Asia	30.4	27.5	30.5	37.9	39.0	54.5	32.7	24.3	32.1	21.7	14.7	24.1
	Final	US	21.7	22.8	29.0	22.5	21.9	31.4	16.8	21.0	21.4	25.5	26.9	46.5
	Final	EU15	21.7	22.6	14.9	15.2	15.9	6.9	17.4	19.2	4.2	15.6	13.6	12.4
IM	Parts	East Asia	81.2	87.2	83.2	71.6	73.0	81.6	74.6	78.1	80.7	63.2	70.4	76.9
	Parts	US	5.4	3.7	3.8	12.8	11.2	10.8	11.6	10.8	6.9	18.6	13.8	10.2
	Parts	EU15	10.1	7.1	11.1	11.0	12.3	4.8	9.5	8.2	7.7	12.7	11.3	6.0
	Final	East Asia	55.2	68.3	73.0	68.3	79.0	59.5	69.0	78.0	86.1	56.4	58.9	121.2
	Final	US	11.8	6.6	2.1	9.1	10.2	14.4	11.1	8.2	2.2	17.8	9.0	-37.8
	Final	EU15	27.1	19.9	18.1	15.8	-0.5	14.1	13.4	10.9	0.5	17.7	25.5	12.8

Note: Contribution ratios during the drop and recovery periods express ratios of contribution to the reduction in trade with the world during the period between September 2008 and February 2009, and of contribution to the increase in trade with the world during the period between February 2009 and July 2009. In the cases of underlined figures for transport equipment, trade with the world increased during the drop period and decreased during the recovery period.
Source: Ando (2010b).

These observations verify that production networks are robust and elastic even against massive macro shocks such as the current financial crisis. They also indicate that the importance of the East Asian market itself was already significant before the crisis, and that its significance was enhanced through the recovery process.

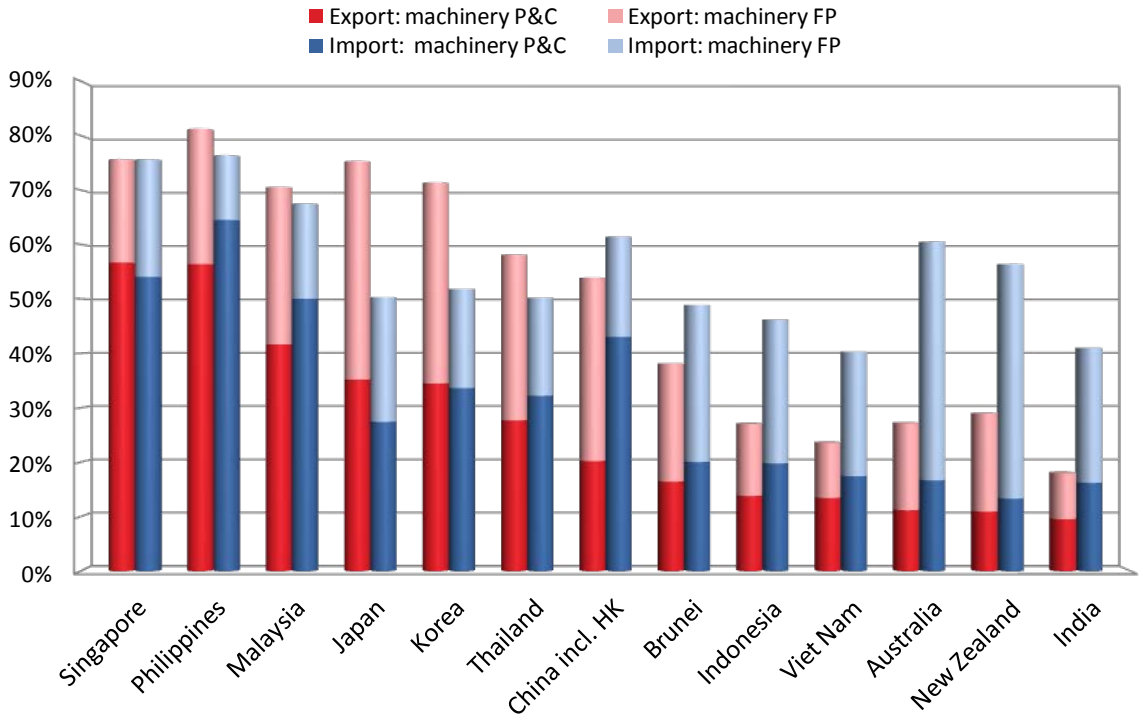
2-5. Diversified degree of participation in production networks

2-5-1. Skewed geographical distribution of production networks

East Asian production networks are now the most advanced and sophisticated in the world. However, we must note that not all countries and regions in East Asia are included in networks. Actually, only a small portion of East Asia participates in the quick high-frequency production networks in the machinery industries. There exist significant thresholds which countries or regions must surmount before they can enter

production networks. This is in fact the other side of the coin of durability and stability.

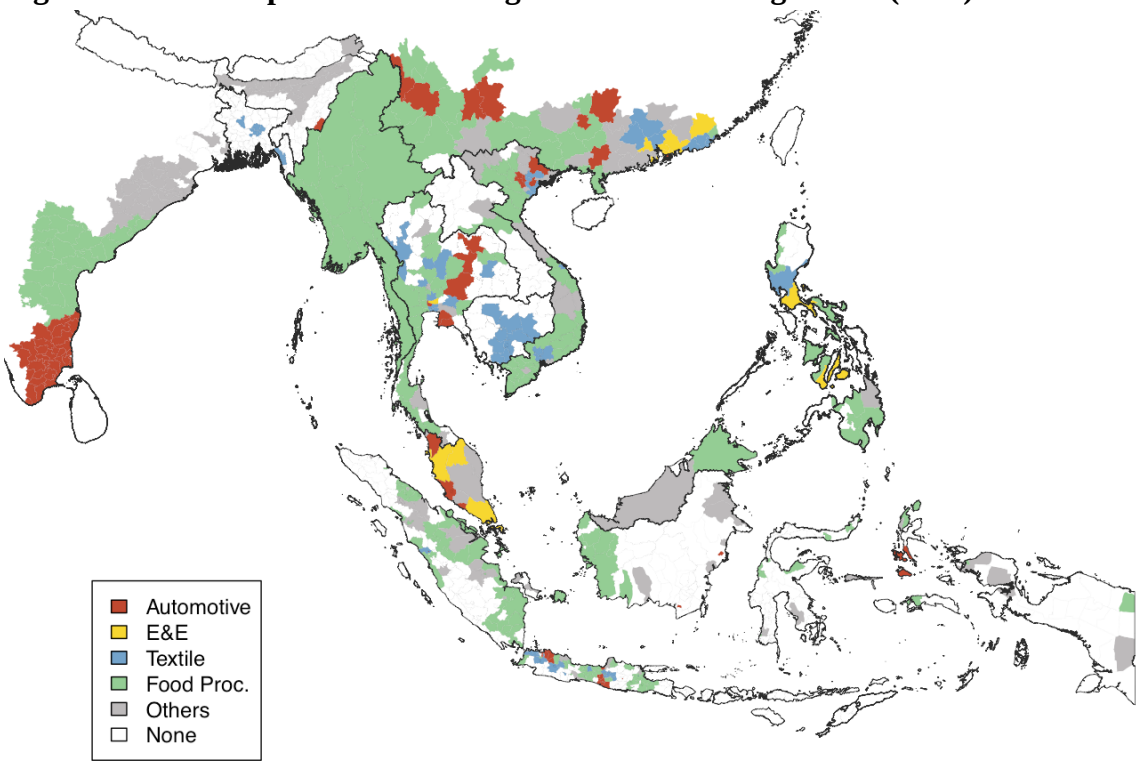
Figure 2-11. Shares of machineries in total exports/imports of manufactured goods to/from the world in 2007



Source: Kimura and Obashi (2010).

Figure 2-11 is another version of Figure 2-3, focusing only on East Asian countries. Proportions of machinery trade in total manufacturing trade, particularly on the export side, are widely different between countries. In Singapore, the Philippines, Malaysia, Japan, and Korea, over 70% of manufacturing exports are machineries. Thailand and China, including Hong Kong, are above 50% in the ratio of machinery exports in total manufacturing exports. The proportion of machinery parts and components exports is also rather high in these countries. However, other East Asian countries, especially Indonesia, Viet Nam, and India, have low export ratios of machineries, which vividly indicates that their participation in international production networks is not yet at full scale.

Figure 2-12. Comparative Advantage in Manufacturing Sector (2005)

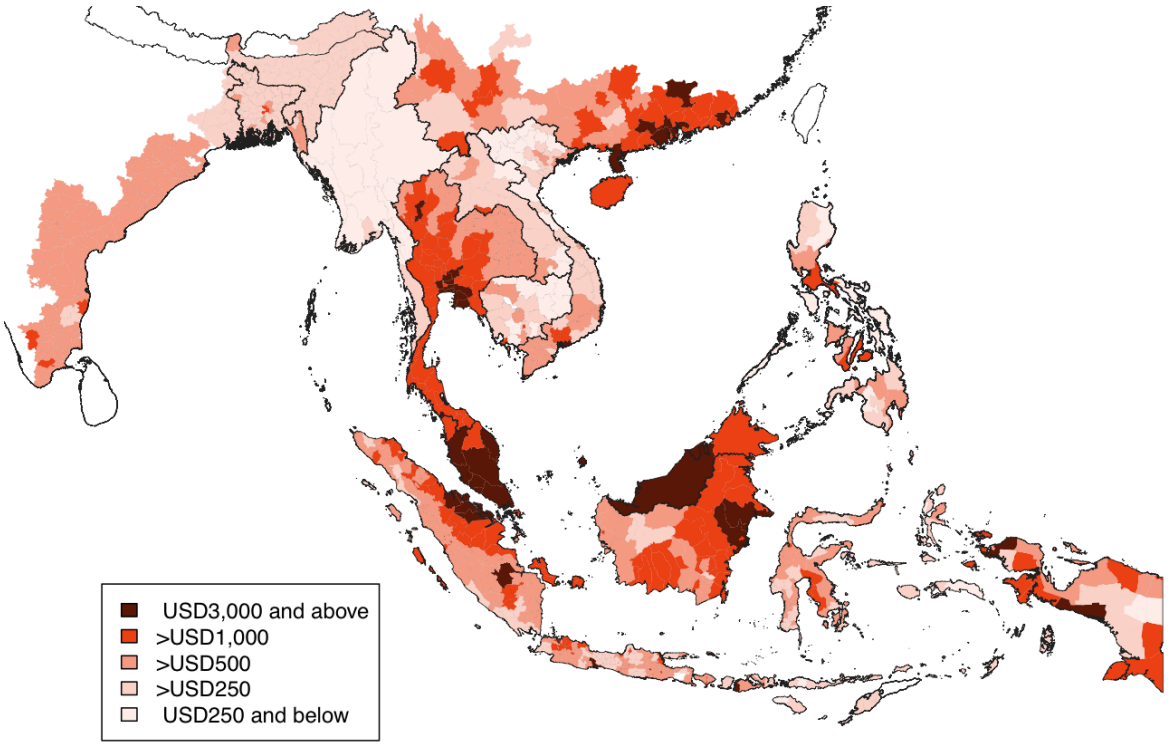


Source: Kumagai, *et al.* (2010).

Figure 2-12 shows the locations of manufacturing sub-sectors in ASEAN, and parts of some other East Asian countries. At provincial level, we first check whether manufacturing value added occupies 10% or more in its GDP. When the manufacturing share is 10% or more, we then identify the largest sub-sector among automotive, electrical and electronic, textiles and garment, food processing, and other manufacturing. The figure shows that only a small number of provinces participate in the quick and high-frequency type of production networks, in the automotive and electric/electronic machinery sectors. Outside such areas, some provinces have textiles and garment as well as food processing. Although these activities are sometimes connected with the world market, production networks are typically slow and low-frequency. Further from these provinces, little manufacturing activity is found.

Figure 2-13 presents the level of per capita GDP by province in these countries. Income levels differ widely, not only across countries but also across regions within each country. This means that differences in development stage are not fully utilized in extending production networks. The mechanics of fragmentation and agglomeration should be more aggressively explored in order to pursue both deeper economic integration and narrowing development gaps in these areas.

Figure 2-13. Nominal GDP per-capita (2005)



Source: Kumagai, *et al.* (2010).

2-5-2. Why are production networks skewed?

One of the important properties of international production networks is the existence of a substantial threshold in participation. In order to enter into production networks, countries or regions must meet a certain set of criteria. The reasons for the existence of such qualification criteria are threefold.

First, when MNEs design the geographical structure of production networks, both location advantages for production blocks and service link costs are thoroughly assessed. Not all countries/regions can pass this strict test.[11] Second, location advantages for production blocks, and service links to connect production blocks, are accompanied by a kind of dynamic economy of scale at an industry or macro level. Once a country or a region enters production networks, and the number of firms participating in them increases, various information and know-how on both firms and host countries starts accumulating, which accelerates further improvement of location advantages and service links. Third, there exist substantial costs for a firm to establish

[11] Hayakawa and Kimura (2009) conduct a gravity equation exercise on bilateral trade of machinery parts and components trade, in order to identify a list of qualifications for participating in international production networks. They find that low country risks and small bilateral exchange rate fluctuation are important elements for participating in the networks.

relation-specific transaction channels and construct production networks.

The latter two will work as a kind of sunk cost that generates the path-dependent nature of network participation. These can also be interpreted as the other side of the coin of the durability and resiliency of production networks.

2-5-3. How can we expand the frontier of production networks?

Large disparity in development stages and income levels suggests differences in location advantages, which can potentially be exploited in the fragmentation of production. On the other hand, there exists the path-dependent nature of network participation that generates a high threshold for participating in production networks. In order to accomplish one of our missions, namely "narrowing development gaps," we should examine how and to what extent we can expand the geographical coverage of production networks.

Because of the nature of dynamic economies of scale, some kind of "big push" may be needed in order to break out of an isolated situation. In addition, not all counties and regions may enter into production networks, particularly in cases of quick and high-frequency production networks in the machinery industries. A certain level of population size would be required for acquiring a critical mass of production blocks.

There are, however, a number of countries and regions in East Asia where good potential for participating in production networks exists. Some areas are fairly close to an industrial agglomeration, so that some dispersion effect may provide a chance to attract production blocks. Others are already working in slow and low-frequency production networks, such as in garment and footwear, and a marginal improvement of the investment climate may trigger full participation in production networks. Some cities are far behind in industrialization, but their population size suggests possibilities for entry into production networks. The CADP designates these countries/regions as "Tier 2". In order to find and remedy crucial bottlenecks to the initiation of industrialization, extended fragmentation theory and new economic geography will provide workable checklists for constructing development strategies.

There also exist countries and regions where their participation in quick and high-frequency production networks seems difficult in the short run. They are typically geographically isolated, are located far from existing industrial agglomerations, have small population size, and lack linkages with the world market. The CADP designates these areas as "Tier 3". These areas have often been regarded as inevitably retarded areas, and the only scenario for development has often been the modest promotion of the primary sector following the principles of static comparative advantage. However, if reliable middle to long distance logistics infrastructure were

constructed, and the areas were connected with urban centers and the world market, completely different scenarios for development could be designed. The extended fragmentation theory and new economic geography will work even in cases of slow and low-frequency production networks, .

2-6. Industrial agglomeration, technology transfers, and innovation

2-6-1. Unprecedented formation of industrial agglomerations

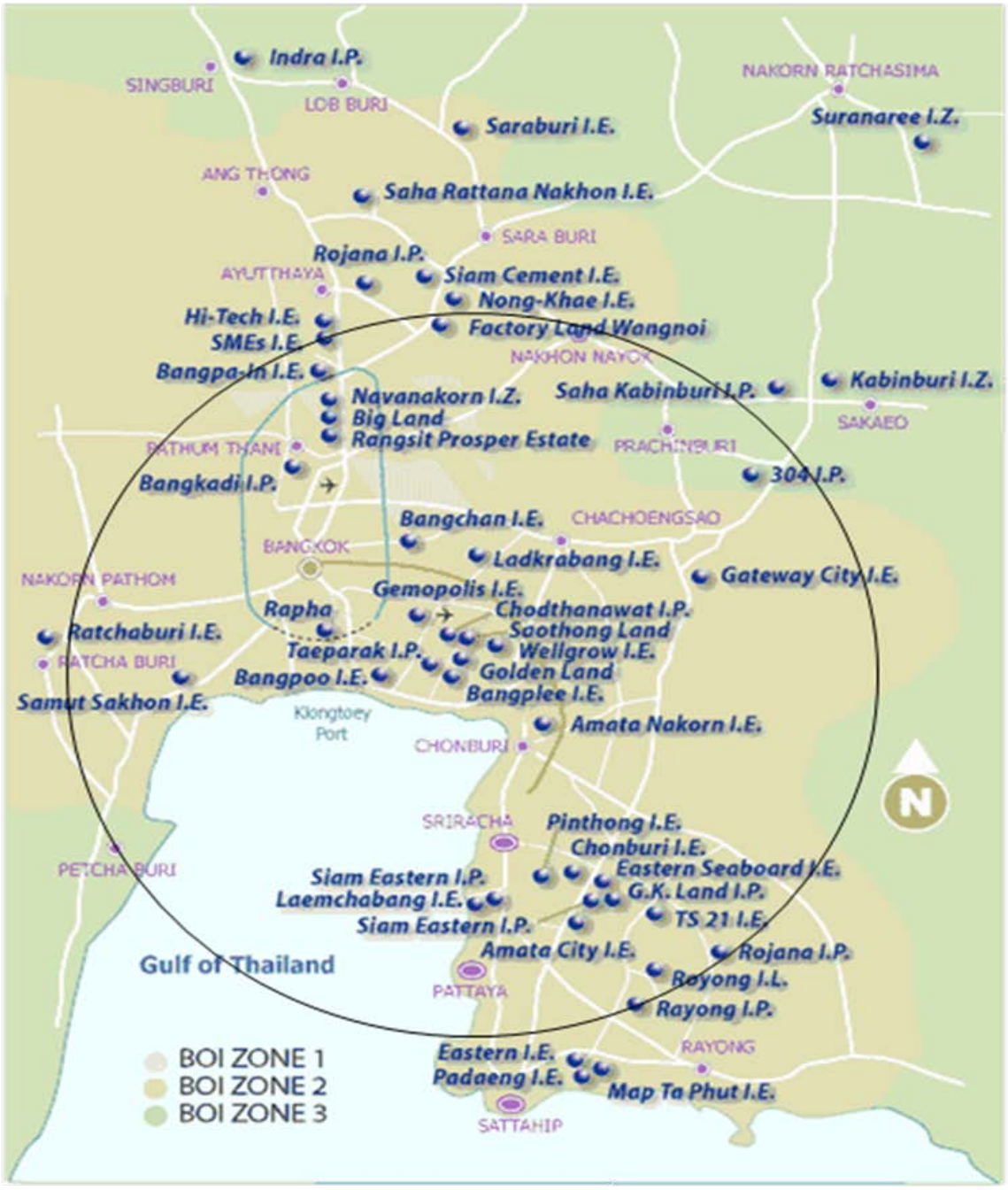
Developing East Asia is the only region where industrialization has reached the stage of forming industrial agglomerations in an open setting.

These industrial agglomerations differ from what we have observed in other parts of the developing world. They are not simply agglomerations of population. They are quite different from import-substituting industrial agglomerations with trade protection. Rather, they have evolved from unorganized clusters of production blocks to a tight arm's length division of labor in extensive trade liberalization and facilitation. The CADP calls these regions "Tier 1".

How far industrial agglomerations have reached depends on stages of development. In Singapore, Selangor, and the Bangkok Metropolitan Area, we observe the accumulation of a critical mass of production blocks with active arm's length fragmentation in just-in-time arrangements. Figure 2-14 is a map of the Bangkok Metropolitan Area indicating the location of major industrial estates. Within a 100km diameter zone, highway networks in suburban areas and the ample supply of electricity and other economic infrastructure are sufficient to cater for a critical mass of industrial activities. Firms can extend their just-in-time supply chains mostly within 2.5 hours and with multiple transactions per day. Industrial estates and factories are fairly dispersed in order to avoid excessive concentration of residential areas for labor, yet white collar workers are still able to commute from city centers. Massive logistics infrastructure supports efficient connections with other industrial agglomerations.

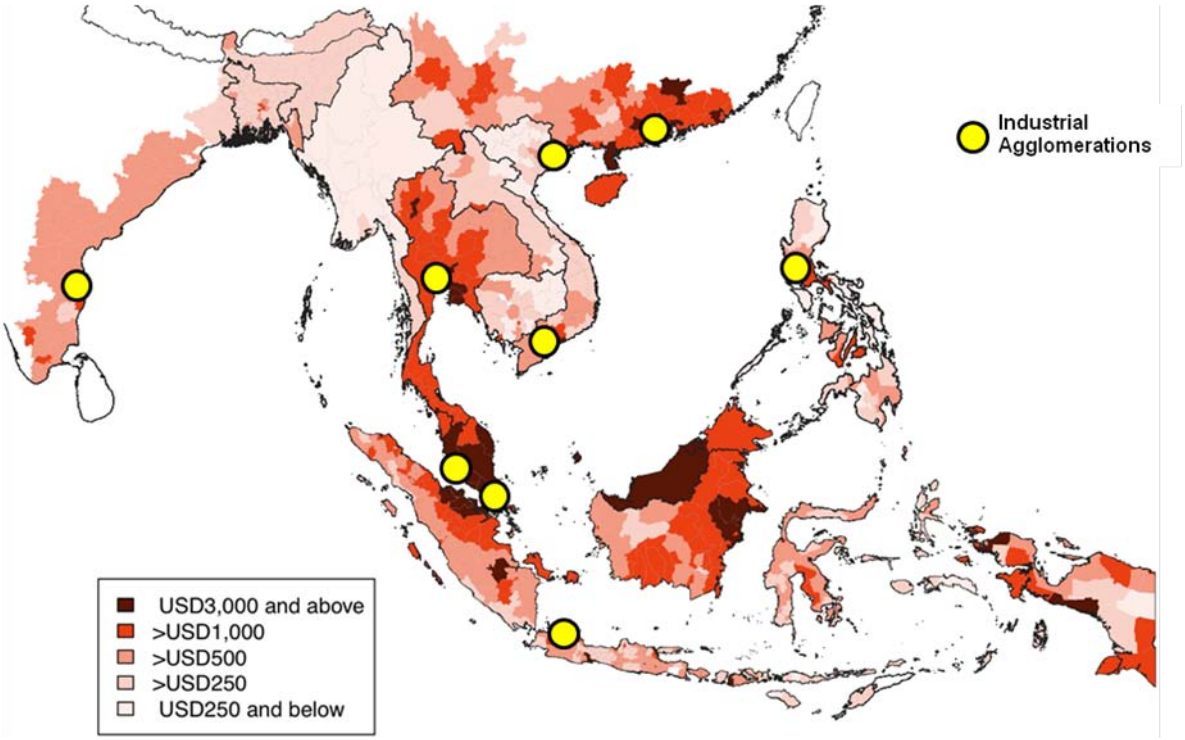
Some industrial agglomerations such as Manila and Jakarta have not yet reached the stage that Bangkok and others have achieved. A certain number of production blocks are already there, but dense arm's length fragmentation has not yet developed. Ho Chi Minh City and Hanoi are emerging but are still small in the accumulation of production blocks, while showing some obvious bottlenecks. In ASEAN and surrounding East Asia, a number of cities exist which have good potential for becoming significant industrial agglomerations (see Table 2-15).

Figure 2-14. Industrial Agglomeration in Bangkok



Note: The circle of 100 km has been added by the author.
Original Source: Board of Investment, Thailand
Source: Kimura (2009).

Figure 2-15. Industrial agglomerations (Tier 1) in East Asia



Source: ERIA/IDE-JETRO GSM Team

2-6-2. Perspectives for further economic development

The great challenge is how to step up from middle-income to fully developed economies

Development economics has long investigated development strategies on how to initiate industrialization, alleviate poverty, and reach a middle-income level. Whether the East Asian model that we are presenting is accepted or not will surely make certain differences in the direction of travel, but our discussions among development economists are already mature enough to share a large scope of common elements.

Development steps beyond middle-income level, however, are uncharted territory. Our casual observation suggests a number of difficulties that countries would face at the middle-income level. Losing competitiveness in labor-intensive industries forces them to restructure their industrial base, but it is not easy to find new industries. Although globalization obviously accelerates economic growth, industrialization tends to depend heavily on MNEs, and local firms and entrepreneurs are not well developed. Absolute poverty may not be a major issue anymore, but political and social conflict between relative winners and losers in globalization tends to become intense. Mismatch between supply of and demand for human capital often ends up with the serious frustration of middle-income people. Perspectives for an innovative society are not

easily drawn. A number of middle-income countries have stacked up with middle-income symptoms, have failed to sustain economic growth, and have suffered from political turmoil.

In the case of ASEAN and East Asia, robust sustained growth of productive sectors is fostering the development of a middle class, and social conflict between those who own resources and those who do not is relatively mild. Steady reduction in the proportion of population below the poverty line and the expansion of middle-income population are clear successes. MNEs in general are operating in a competitive setting, and their market power does not seem to dominate in most cases. However, the dependence on MNEs for industrialization is heavy, and local players may not feel ownership of their own economic growth.

To take advantage of the characteristics of East Asian economies, the availability of effective industrial links in industrial agglomerations is the key. One of the elements for making breakthroughs is the penetration of local firms into production networks, which provides them with opportunities for technology spillover or even technology transfer. The core of an innovative society should be based on its productive sectors. The development of human capital is definitely required in the middle and long run, and the supply of human capital should be consistent with the actual level of industrial development.

CHAPTER 3.
THREE TIERS OF DEVELOPMENT STRATEGIES

This chapter presents comprehensive development strategies, focusing on the development of logistics and economic infrastructure, through three tiers of development stages in terms of the degree of participation in production networks. Tier 1 focuses on countries/regions trying to step up from middle-income to fully developed countries/regions. Tier 2 includes countries/regions that intend to participate in production networks. Tier 3 refers to countries/regions in which the development of long-distance logistics infrastructure would provide new perspectives for industrial development. Three sub-regions, and the concept of industrial/economic corridors, are presented in order to link the three tiers with active interaction and feedback in the overall spatial structure of ASEAN and East Asia.

3-1. Policy scope in our development strategies

Although a number of development plans and cooperation programs have already been planned and implemented, a solid and logical connection between infrastructure development and industrialization does not seem to be fully established. We frequently observed that when we constructed a highway the expected amount of traffic was not generated. The issue is not simply about the choice of traffic forecasting methods, but concerns our perspectives on industrial promotion with road and supplementary economic infrastructure. For example, in the Greater Mekong Sub-region (GMS), North-South, East-West, and Southern Corridors have heterogeneous potential for industrialization and require a different set of complementary policies. The CADP tries to establish an effective link between infrastructure development and industrialization in the dynamic spatial structure.

Our conceptual framework based on the extended fragmentation theory and new economic geography will be applied in the construction of three-tier development strategies. In East Asia, production networks have developed and reached the stage in which both fragmentation and agglomeration occur. The CADP provides development

strategies to further utilize forces of fragmentation and agglomeration in order to achieve both the deepening of economic integration and the narrowing of development gaps.

The extended fragmentation theory suggests that a crucial bottleneck is often to be found in service link costs. A reduction in service-link costs is obtained by the improvement of both soft and hard infrastructure. Soft infrastructure refers to institutional connectivity that includes trade liberalization and facilitation as well as various measures for *de jure* economic integration.[1] Hard infrastructure denotes physical connectivity and consists of logistics infrastructure and logistics services.

New economic geography, on the other hand, suggests that a reduction in service-link costs, or in other words, trade costs, generates agglomeration forces and dispersion forces. Without properly controlling these two opposing forces, we cannot realize the deepening of economic integration and the narrowing of development gaps at the same time. Policies to improve location advantages for production costs *per se* must be considered in order to complement the improvement of institutional and physical connectivity.

In the following section, we will list major policies in development strategies. For Tier 1, we will use a full set of the 2x3 policy matrix and consider further development of two-dimensional fragmentation along the geographical distance axis and along the disintegration axis (see Table 1-1 again). For Tier 2, the priority will be placed on the upper part of the 2x3 policy matrix in order to specify bottlenecks for participating in production networks. It will also be important to take care of the balance between agglomeration forces and dispersion forces. For Tier 3, the upper part of the 2x3 matrix should also be emphasized though in a looser context.

Then we will consider feedback among the three tiers. Both the extended fragmentation theory and new economic geography emphasize the importance of interaction among countries/regions in different tiers. Three sub-regions in ASEAN, which include three tiers at the same time, are proposed, and the concept of economic corridors emerges in order to stimulate interaction.

[1] Although institutional connectivity is not extensively discussed in CADP, its importance should not be neglected. ASEAN and East Asia have made considerable efforts towards the deepening of economic integration, which have helped to pave the way for the development of production networks. ERIA is also conducting a number of projects on institutional connectivity; see, for example, Corbett and Umezaki (2009) and Urata and Okabe (2010).

3-2. Tier 1: From middle-income to fully developed countries/regions

3-2-1. Exploring positive agglomeration effects

Countries or regions in Tier 1 have already been successful in participating in production networks, and some of them have attracted a considerable number of production blocks. The next task is to take advantage of positive agglomeration effects in developing arm's length (inter-firm) vertical division of labor in industrial agglomerations.

Table 3-1 is a replication of Table 1-1, with typical policies being required for Tier 1 in red letters. In Tier 1, the full scale of two-dimensional fragmentation should be promoted, and thus all items in the 2x3 policy matrix are essential. However, some of them must have already been accomplished, particularly for fragmentation along the distance axis. Some important leftovers in the upper part of the table would be on service links and location advantages for attracting a critical mass of production blocks within certain geographical extensions of metropolitan areas and formulating industrial agglomerations. Typical bottlenecks would be soft and hard logistics connections across national borders, metropolitan transport systems, electricity supplies, labor laws and practices, amongst others. After dealing with such issues, the lower part of the table for fragmentation along the disintegration axis becomes crucial for developing arm's length transactions.

Positive agglomeration effects emerge as a kind of economies of scale within a certain geographical extension and turn out to be a part of location advantages. Agglomeration effects also yield a certain level of stability in industrial structure.

Table 3-1. The 2x3 policy matrix for Tier 1

	Reduction in fixed costs to develop production/distribution networks	Reduction in service link costs connecting production blocks	Further costs reduction in production cost per se in production blocks
Fragmentation along the distance axis	Policies to reduce investment costs	Policies to overcome geographical distance and border effects	Policies to strengthen location advantages
	(1) improvement in stability, transparency, and predictability of investment-related policies; (2) investment facilitation in FDI-hosting agencies and industrial estates; and (3) liberalization and development in financial services related to capital investment.	(1) reduction/removal of trade barriers such as tariffs; (2) trade facilitation including simplification and improved efficiency in custom clearance/procedures; (3) development of transport infrastructure and improved efficiency in transport and distribution services; (4) development of telecommunication and ICT infrastructure; (5) improved efficiency in financial services related to operation and capital movements; and (6) reduction in costs of coordination between remote places by facilitation of the movement of natural persons.	(1) establishment of educational/occupational institutions for personnel training to secure various types of human resources; (2) establishment of stable and elastic labor-related laws and institutions; (3) establishment of efficient international and domestic financial services; (4) reduction in costs of infrastructure services such as electricity and other energy, industrial estates services; (5) development of agglomeration to facilitate vertical production chains; (6) establishment of economic institutions such as investment rule and intellectual property rights; and (7) various trade and investment facilitation.
Fragmentation along the disintegration axis	Establishment of economic environment to reduce set-up costs of arm's length transactions	Development of institutional environment to reduce the cost of implementing arm's length transactions	Policies to strengthen competitiveness of potential business partners
	(1) establishment of economic system to allow co-existence of various business partners as well as making various types of contracts; (2) various policies to reduce costs of information gathering on potential business partners; (3) securing fairness, stability, and efficiency in contract; and (4) establishment of stable and effective institutions to secure intellectual property rights.	(1) policies to reduce monitoring cost of business partners; (2) improvement in legal system and economic institutions to activate dispute settlement mechanism; and (3) policies to promote technical innovations in modulation to further facilitate outsourcing.	(1) hosting and fostering various types of business partners including foreign and indigenous firms; (2) strengthening supporting industries; and (3) various policies to promote the formation of agglomeration.

3-2-2. Development of SMEs in industrial agglomerations

In taking advantage of positive agglomeration effects, the role of small and medium enterprises (SMEs) is crucial. SMEs are essential participants in arm's length vertical division of labor within industrial agglomerations and work in a just-in-time setting in the first layer of transactions. Without them, each production block is kept isolated, and positive agglomeration effects are not realized.

Some countries have had a certain pool of local firms even before MNE sentered the market, and these local firms can readily work in a supporting industry role in industrial agglomerations. Most LDCs in East Asia, however, have not completed such preparations. At the initial stage of formulating arm's length vertical division of labor within industrial agglomerations, multinational SMEs often become major players.[2] Compared with local (indigenous) SMEs, the strengths of multinational SMEs are to be found in non-price competitiveness including the stability of product quality, precise delivery timing, credibility, and low monitoring costs so that transaction costs or service link costs in the disintegration-type fragmentation are low. Aggressive hosting of multinational SMEs is indeed effective in the formation of industrial agglomerations.

Once a certain level of vertical links among multinationals is developed in industrial agglomeration, local SMEs begin to encounter opportunities to enter production networks. Local SMEs often have advantages in price competitiveness vis-à-vis multinational SMEs. Once they are successful in obtaining a certain level of non-price competitiveness, they are qualified to participate in vertical division of labor in industrial agglomerations.

An ERIA study investigates SMEs in the context of participating in production networks and examines methods for enhancing SME participation in production networks (Thanh, Narjoko, and Oum, 2010). In the study, Harvie (2010) provides a framework for the analysis of the core ingredients/characteristics required to enhance the capacity of SMEs participating in regional production networks (Figure 3-1). Furthermore, Harvie, Narjoko, and Oum (2010) develop the ERIA Survey on SME Participation in Production Networks implemented in Indonesia, Malaysia, the Philippines, Thailand, Cambodia, Laos, Vietnam, and China and conduct some basic regression analysis. The number of samples amounts to 912. The major findings are

[2] Ando (2010a) provides an overview of Japanese SMEs working in production networks.

as follows:

(1) SMEs in production networks care more about distribution-logistics and business environment barriers than those not in production networks.

(2) SMEs in lower quality production networks are still occupied in taking care of internal constraints while SMEs in higher quality production networks seem to be keen on external constraints.

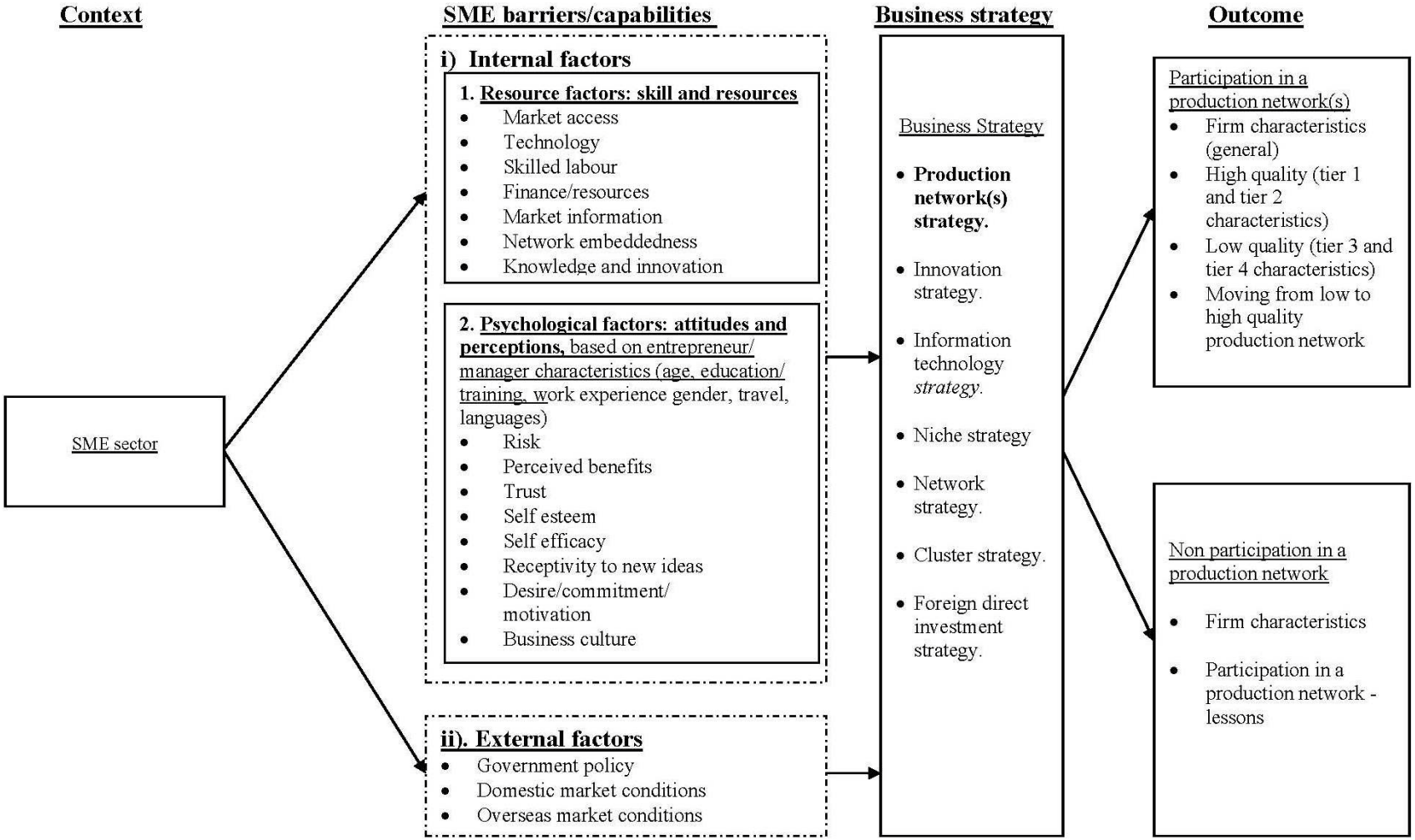
(3) Productivity, foreign ownership, financial characteristics, innovation efforts, and managerial/entrepreneurial attitudes are key characteristics of SMEs in production networks compared with those outside such networks.

(4) Size matters in particular for SMEs in higher quality production networks.

In summary, they find that SMEs must be qualified to participate in production networks by meeting a certain level of performance and once qualified, they can be important players in existing production networks.

In fact, local SMEs and local firms in general have active transactions with MNEs. Although official statistics do not provide such information, the results of a survey carried out on Japanese firms provide some clues. Figure 3-2 presents by-origin sources of procurement by manufacturing affiliates of Japanese firms located in ASEAN. In total procurement, 39.6% are from the host country, of which 46.9% are from local firms. Production networks are designed and operated predominantly by MNEs at an initial stage. However, a variety of evidence suggests that production networks can be shared with local firms at more advanced stages

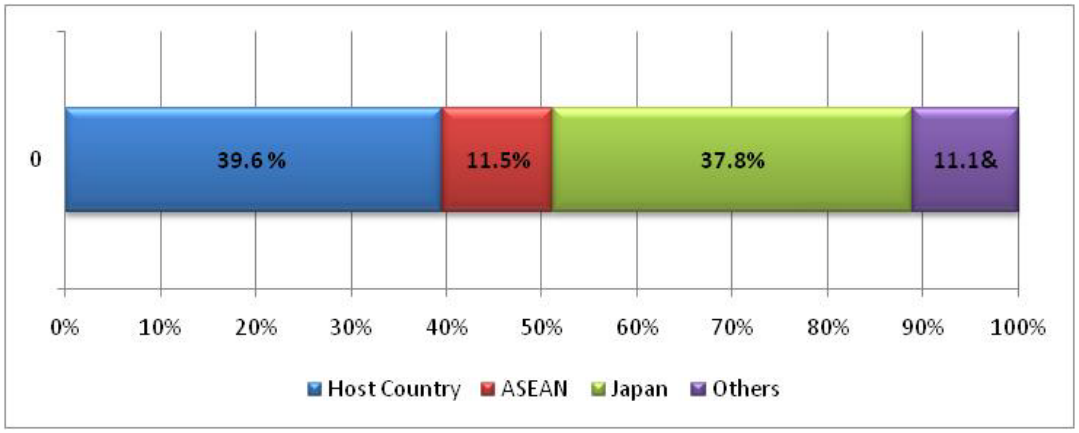
Figure 3-1. SMEs and production networks: Framework outline



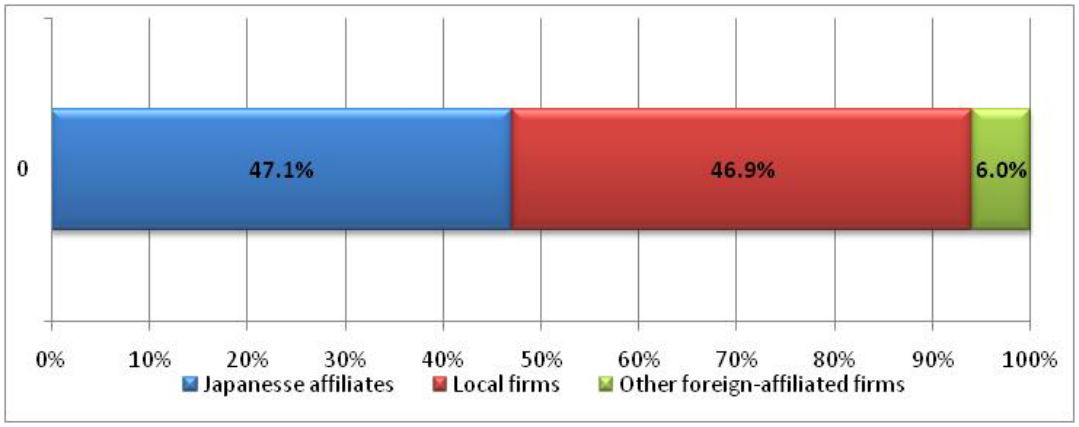
Source: Harvie (2010)

Figure 3-2. By-origin sources of procurement by manufacturing affiliates of Japanese firms in ASEAN

(1) By-origin ratios of procurement in total procurement



(2) By-firm-nationality ratios of procurement in local procurement



Source: Japan External Trade Organization (JETRO) (2008).

3-2-3. Making industrial agglomerations innovative

To progress from middle-income to the fully developed stage, we must construct an innovative society. Up to the middle-income level, industrialization has been fairly successful but has been led predominantly by MNEs. We observe the gradual penetration of local firms into production networks but cannot firmly conclude that it will result in the construction of an innovative society in which MNEs and local firms/entrepreneurs/engineers will work together for active innovation.

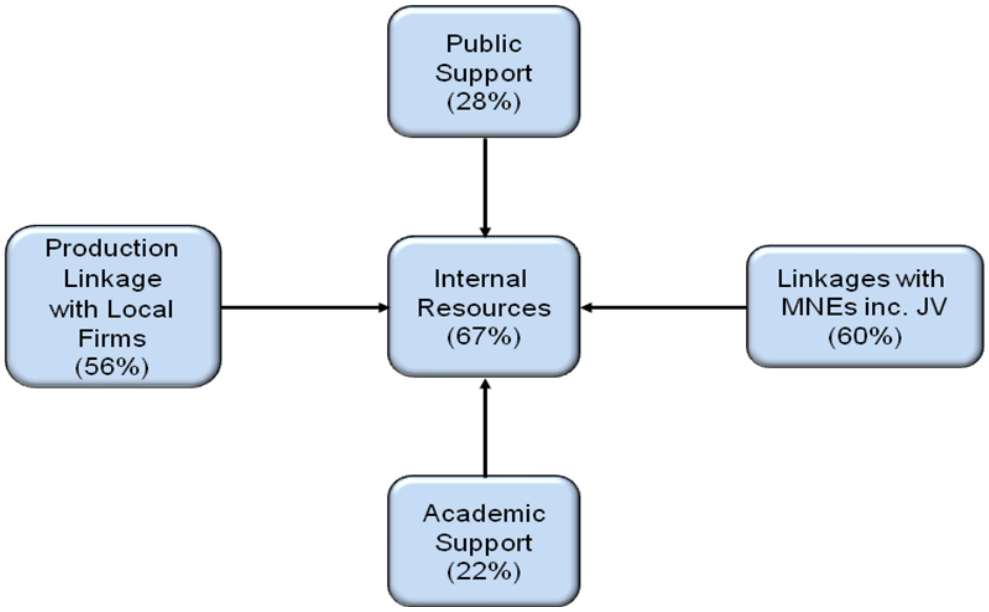
A three-year study of agglomeration and innovation by ERIA investigates innovative information flows among firms, both with and without foreign capital, in ASEAN.[3] Following the Schumpeterian definition, innovation here includes (i)

[3] See Limskul (2009) and Intarakunmerd (2010). Also see Machikita and Ueki (2010a, 2010b, 2010c, 2010d) for specific analytical works based on the project. There exists a huge amount of academic literature on agglomeration and technology spillover using firm-level microdata. See Hayakawa, Kimura, and Machikita (2010) for an extensive literature survey. However, in many

product innovation, (ii) application of new technology, (iii) organizational change, (iv) securing of new suppliers, and (v) securing of new markets. The study conducts extensive questionnaire surveys on what sort of innovative information is acquired by firms located in Indonesia, the Philippines, Thailand, and Vietnam, and through what sort of channels.

A part of the study results is presented in Figures 3-3 and 3-4. Figure 3-3 shows the sources of innovative information obtained by MNEs and joint ventures. Because firms can answer multiple choice questions, percentages are not summed up to 100%. While internal resources have a high share, inter-firm linkages, both with local firms and MNEs, are important sources of innovative information. The case of local firms presented in Figure 3.4 presents a similar pattern. Public support has a higher share than in the case of MNEs and joint ventures through inter-firm linkages are also important.

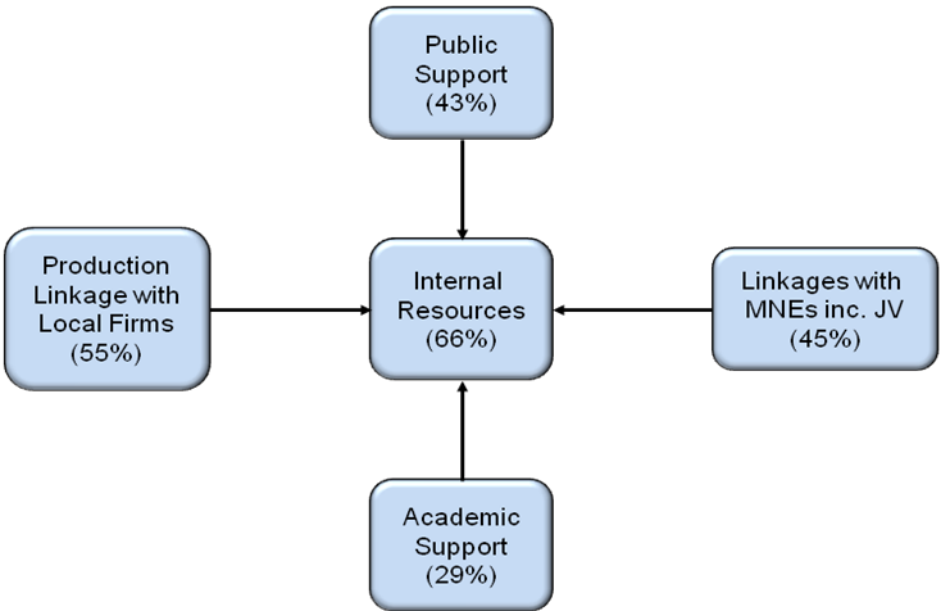
Figure 3-3. Sources of innovative information for MNEs including JVs in East Asia (Indonesia, the Philippines, Thailand, and Vietnam)



Source: ERIA/IDE-JETRO 'Industrial agglomeration" Project Team.

cases, studies do not pinpoint the nature of innovative information and the channels of its flows. The ERIA Study is unique in investigating these issues explicitly.

Figure 3-4. Sources of innovative information for local firms in East Asia (Indonesia, the Philippines, Thailand, and Vietnam)



Source: ERIA/IDE-JETRO 'Industrial agglomeration" Project Team.

Intarakumnerd (2010) conducts more extensive and targeted studies on (i) knowledge transfer through production linkages, FDI, and trade, (ii) absorptive capacity and the current state of sourcing inputs for innovation inside firms, and (iii) agglomeration economies including pro-competitive effects, based on a total of 864 firms covered by the survey: 183 firms in Indonesia, 203 firms in the Philippines, 178 firms in Thailand, and 300 firms in Vietnam. In its statistical analysis, the following variables are significant for innovation: firm size, cooperation with MNEs, technical assistance financed or provided by government-owned financial institutions, licensed technologies from other firms, and the number of linkages with partners or sources of knowledge. It is also notable that the impact of face-to-face knowledge exchanges related to product innovation is significant and managerial experience with foreign firms is important for innovation and upgrading.

Overall, innovation activities are not uncommon even in developing East Asia; a large number of firms including local ones have multiple channels of innovative information. The issue is how to upgrade the contents and enter the phase of self-propelling innovation activities that capture positive agglomeration effects. Although more detailed research must be conducted, we can tentatively conclude that linkages with MNEs together with public support are crucial for local firms' innovation but are established only with a certain level of absorptive capacity.

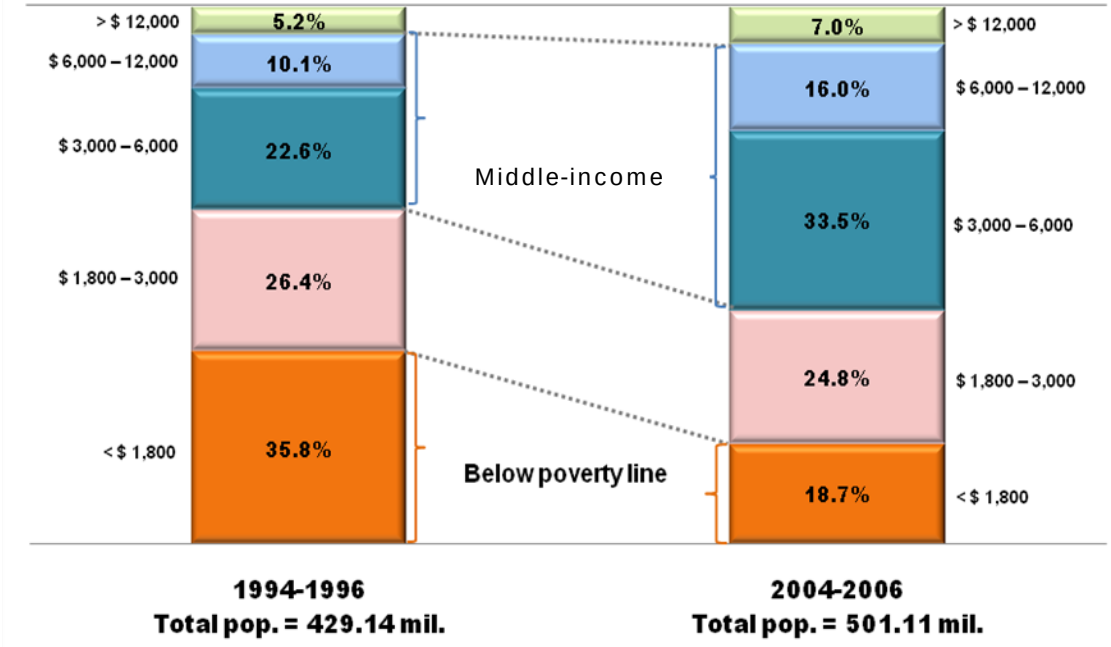
3-2-4. Expansion of middle-income population and human capital

In the last two decades, developing East Asia has accomplished a drastic decrease in the proportion of people living below the poverty line and a rapid expansion of its middle-income population.

Figure 3-5 presents changes in population structure by income level in ASEAN based on the World Bank Povcalnet. Povcalnet provides data on the number of people in each country by income level in US dollars on a 2005 purchasing power parity basis. Among ten ASEAN member countries, seven countries excluding Brunei, Myanmar, and Singapore are covered by the data set. Here, we define a person living below the poverty line as an individual with an income below US$1.25 per day, the equivalent of a four-member family with an income below US$1,800 in a year. On the other hand, middle-income population is defined as people with an individual income between US$2 and US$8 per day or with a four-member family income between US$3,000 and US$12,000 per annum.

In the decade between 1994-1996 and 2004-2006, the proportion of people living below the poverty line reduced from 36% of the total population to 19% in the seven countries, and the actual number of such people fell to below 10 million. On the other hand, the middle-income population expanded from 33% (23%+10%) of the total population to 50% (34%+16%).

Figure 3-5. Income distribution in ASEAN



Note: (1) Excluding Brunei, Myanmar, and Singapore. (2) In US dollars on the 2005 PPP basis. (3) For a family with 4 persons.
Data Source: The World Bank PovcalNet (http://go.worldbank.org/NT2A1XUWP0).

Figure 3-6. Population by income group: China (US dollars; 2005 PPP adjusted; annual total income of a family with four members)

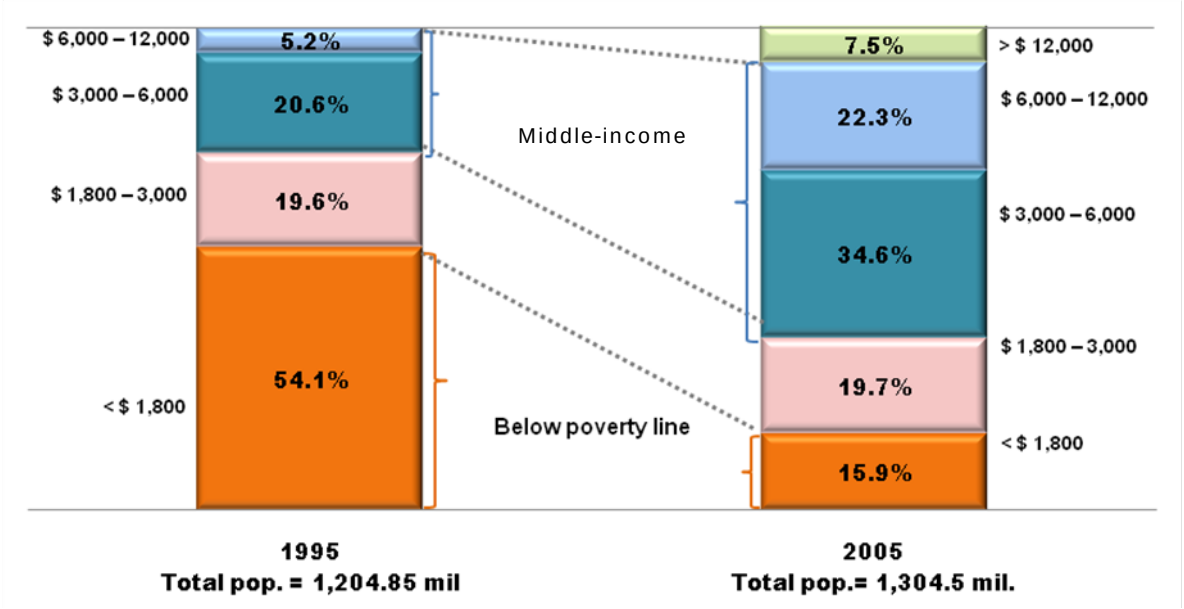
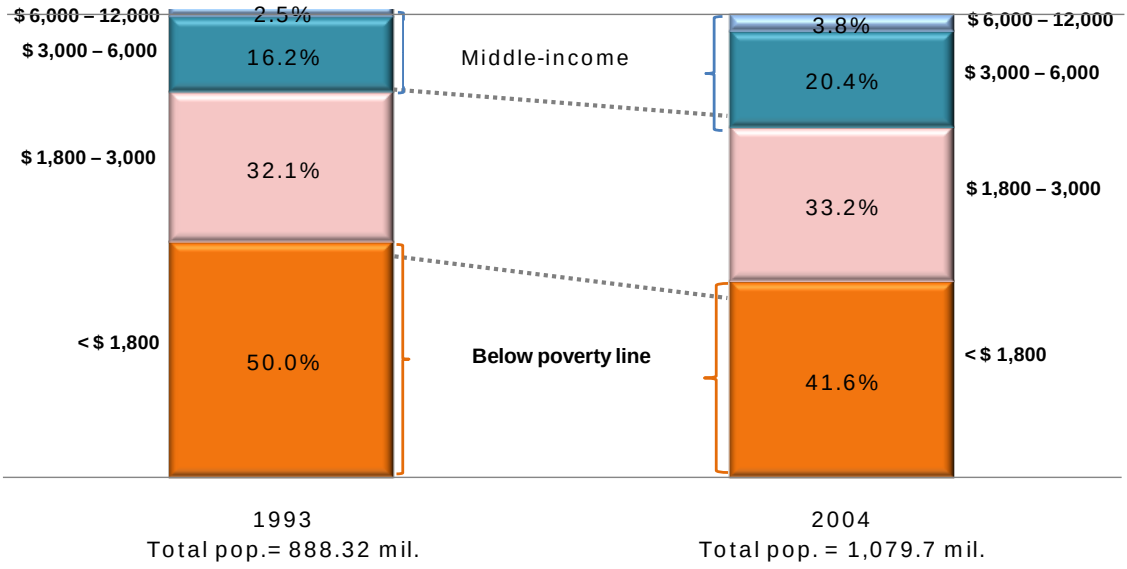


Figure 3-7. Population by income group: India (US dollars; 2005 PPP adjusted; annual total income of a family with four members)



Changes in population structure were more drastic in China (Figure 3-6). The proportion of people living below the poverty line shrank from 54% of the total population in 1995 to 16% in 2005 while the middle-income population exploded from 26% (21%+5%) to 57% (35%+22%). India lagged slightly but nonetheless recorded a steady change (Figure 3-7). Although the actual number of people living below the poverty line increased slightly between 1993 and 2004, the proportion reduced from

49% to 42%. The ratios of middle-income population increased from 18% (16%+2%) to 24% (20%+4%).

It is often claimed that economic growth inevitably worsens income disparity. The case of East Asia, however, seems to provide a counter-example. Although income disparity measures are not specifically examined here, we can at least observe a drastic reduction in the proportion of the population below the poverty line and a strong expansion of the middle-income population in sustained and rapid economic growth. These may be the consequences of East Asia's pattern of economic growth. In this region, economic growth has been reliant on the robust growth of productive sectors with massive employment creation, rather than being heavily dependent on the growth of resource exploitation. Although poverty alleviation remains an important issue for some countries and regions, the main focus of policymakers is gradually shifting to various issues related to the middle-income population.

The definition of middle-income people here may not match the definition of the middle-income people in fully-developed countries; their income is still comparatively low. However, their economic behavior is quite comparable to that of their counterparts in developed countries. Following Engel's law, the proportion of income spent for minimal daily nutrition reduces, and the demand for tradable goods, in particular, consumer durables, expands considerably. They are likely to possess items such as cellular telephones, TV sets, refrigerators, washers, and motorcycles whilst automobiles may still be out of reach. The expansion of the middle-income population increases international trade among East Asian countries, enhances trade openness, and accelerates *de facto* regional market integration.

Middle-income people are willing to make significant investment in their children's education, and this investment will surely be a major source of human capital in a decade or two. A typical failure in middle-income countries is a mismatch in the demand for and the supply of human capital. Investment in human capital is a long-term individual decision and is prone to be misguided due to wrong signals or incorrect predictions for future demands for human capital. It is inevitable that purely labor-intensive industries or production processes gradually lose international competitiveness at this stage. A strong foundation of human capital has yet to be achieved. Leapfrogging is sometimes possible, particularly in the field of ICT. However, solidly productive sectors such as manufacturing and related services sectors will continue to be important in order to make the smooth transition from middle-income to fully developed countries.

In the process of economic growth at this stage, proper restructuring of industrial structures from labor-intensive activities to capital or human-capital intensive activities

is essential. At the same time, countries tend to experience drastic changes in demographic pattern from rural to urban as well as in generational structure. Hence, formal social protection systems become necessary, rather than dependency on informal social protection provided by traditional communities. If governments fail to provide such support, sustained economic growth may be stalled, and political instability may ensue.[4]

As a basis for significant innovation, urban amenities to attract highly-educated human resources become important. An innovative city must have an efficient industrial basis whilst becoming an attractive cultural center at the same time. A comprehensive urban transport system and other urban infrastructure become crucial.

3-2-5. Necessary logistics infrastructure and other economic infrastructure

East Asia is leading the world in the development of international production networks and is exploring a new frontier of its development model. How to connect a strong industrial basis with further development from middle-income to the fully-developed stage is the issue. Effective coordination among different policy modes and various stakeholders is obviously needed.

Infrastructure development is essential for the development strategy for Tier 1. Industrial agglomeration requires a spatial structure of just-in-time systems with highway networks, large-scale logistics infrastructure such as ports and airports, a massive supply of electricity, energy, and water, and dispersed accommodation for workers.

Furthermore, infrastructure development for the construction of a vigorous, innovative society is also required. Desirable urban amenities as well as an efficient industrial basis must be realized in metropolitan areas. It thus requires urban transport systems, modern residential areas, measures to deal with pollution problems, a system of reproduction of human capital including universities, laboratories, and other such facilities, in order for highly-educated people to be willing to live in these places.

Targets in infrastructure development are summarized as follows:

(1) Infrastructure to support efficient industrial agglomeration in spacious metropolitan areas
(2) Large-scale logistics infrastructure to connect with other industrial agglomerations
(3) Infrastructure for innovation basis and the nurturing of human capital
(4) Infrastructure for intelligent and vigorous urban amenities

[4] ERIA started an extensive comparative study on social protection in East Asia. See Asher, Oum, and Parulian (2009).

Major sectors of infrastructure development are tabulated in Table 3-2.

Table 3-2. Infrastructure development in Tier 1

Logistics Infrastructure	Other economic infrastructure	Urban and social infrastructure
1. Road / bridges ▸ Highway system, bridges and bypass roads in and around metropolitan areas ▸ Access roads/bridges to gateway ports/airports **2. Railways** ▸ Urban public transport system (subway, LRT, MRT) and railways to connect urban and suburban areas **3. Ports / maritime** ▸ Sizable port facility to cater massive container transactions and specialized loading facilities **4. Airports** ▸ Sizable airport facility to cater massive movements of passengers and freight	**1. Industrial estates / special economic zones** ▸ High-tech park with private initiatives **2. Energy / power** ▸ Stable and ample supply of electricity and energy for both industries and residences **3. Telecommunication** ▸ Infrastructure services for innovative society	**1. Water and sanitation, medical and others** ▸ Metropolitan and social infrastructure for urban amenity

3-3. Tier 2 Participating in international production networks

3-3-1. Frontiers of international production networks

Tier 2 includes countries/regions that intend to participate in production networks. Countries/regions that do not participate in quick and high-frequency-type production networks can utilize the mechanics of fragmentation to attract manufacturing activities. Taking advantage of fragmentation is actually the quickest way to initiate and promote industrialization in East Asia. There exist a number of successful cases in the neighborhood.

To participate in production networks, we must identify and solve major bottlenecks in three kinds of costs: (i) network set-up costs, (ii) servicelink costs, and (iii) production costs per se. Table 3-3 is again a replication of Table 1-1, in which particularly important policies for Tier 2 are highlighted in red.

At this stage of economic development, the first step is crucial. Whatever the industry or the firm, to host MNEs provides precious opportunities to learn about the

prevailing investment climate. Overall improvement of the investment climate in the whole territory is not necessary at the initial stage. It is appropriate to provide an ideal investment climate at some specific place; to start with special economic zones (SEZs) is a good idea. By working in small specific areas, we should gain experience and accumulate both large and small trouble-shootings.

Some labor-intensive factories producing garment or footwear may already be there. Their complaints and suggestions should be listened to in order to improve the investment climate. They are connected to the world market but operate in slow and low-frequency-type production networks. Finding bottlenecks in the scope of their business provides precious information about the investment climate. Bottlenecks typically reside in service links or some specific economic infrastructure such as the electricity supply.

Once a country or region is successful in attracting a certain number of production blocks, we should start making plans for the overall improvement of the investment climate. The empowerment of investment facilitation including one-stop services in investment attraction should be a priority. It is also important to solve bottlenecks in service links and location advantages in order to expand the scale of production networks. The improvement in the business environment for arm's length fragmentation can also start at this stage, which includes the establishment of legal systems and economic institutions favorable for industrial development.

Table 3-3. The 2x3policy matrix for Tier 2.

	Reduction in fixed costs to develop production/distribution networks	Reduction in service link costs connecting production blocks	Further costs reduction in production cost per se in production blocks
Fragmentation along the distance axis	Policies to reduce investment costs	Policies to overcome geographical distance and border effects	Policies to strengthen location advantages
	(1) improvement in stability, transparency, and predictability of investment-related policies; (2) investment facilitation in FDI-hosting agencies and industrial estates; and (3) liberalization and development in financial services related to capital investment.	(1) reduction/removal of trade barriers such as tariffs; (2) trade facilitation including simplification and improved efficiency in custom clearance/procedures; (3) development of transport infrastructure and improved efficiency in transport and distribution services; (4) development of telecommunication and ICT infrastructure; (5) improved efficiency in financial services related to operation and capital movements; and (6) reduction in costs of coordination between remote places by facilitation of the movement of natural persons.	(1) establishment of educational/occupational institutions for personnel training to secure various types of human resources; (2) establishment of stable and elastic labor-related laws and institutions; (3) establishment of efficient international and domestic financial services; (4) reduction in costs of infrastructure services such as electricity and other energy, industrial estates services; (5) development of agglomeration to facilitate vertical production chains; (6) establishment of economic institutions such as investment rule and intellectual property rights; and (7) various trade and investment facilitation.
Fragmentation along the disintegration axis	Establishment of economic environment to reduce set-up costs of arm's length transactions	Development of institutional environment to reduce the cost of implementing arm's length transactions	Policies to strengthen competitiveness of potential business partners
	(1) establishment of economic system to allow co-existence of various business partners as well as making various types of contracts; (2) various policies to reduce costs of information gathering on potential business partners; (3) securing fairness, stability, and efficiency in contract; and (4) establishment of stable and effective institutions to secure intellectual property rights.	(1) policies to reduce monitoring cost of business partners; (2) improvement in legal system and economic institutions to activate dispute settlement mechanism; and (3) policies to promote technical innovations in modulation to further facilitate outsourcing.	(1) hosting and fostering various types of business partners including foreign and indigenous firms; (2) strengthening supporting industries; and (3) various policies to promote the formation of agglomeration.

3-3-2. Cities or border areas?

Where should we set up SEZs? Border areas located close to a neighboring country may provide good opportunities for a quick start (Kudo (2009). In border areas with more advanced countries, wage differences across national borders generate location advantages while service-link costs can be minimized. Casinos and some other services industries are naturally located there, but it would be beneficial to attract some manufacturing activities as well. This can be a starting point in order to accumulate learning processes. However, border areas typically have small populations and may not be a core of industrial agglomerations in the future. Certain accumulation of population may become crucial at a further point in economic development.

Ishida (2009) investigates how EPZs can be placed in economic corridors. Benevolent interactions among different tiers are important. Rather than considering isolated development strategies, we plan to maximize synergy effects among neighboring different tiers.

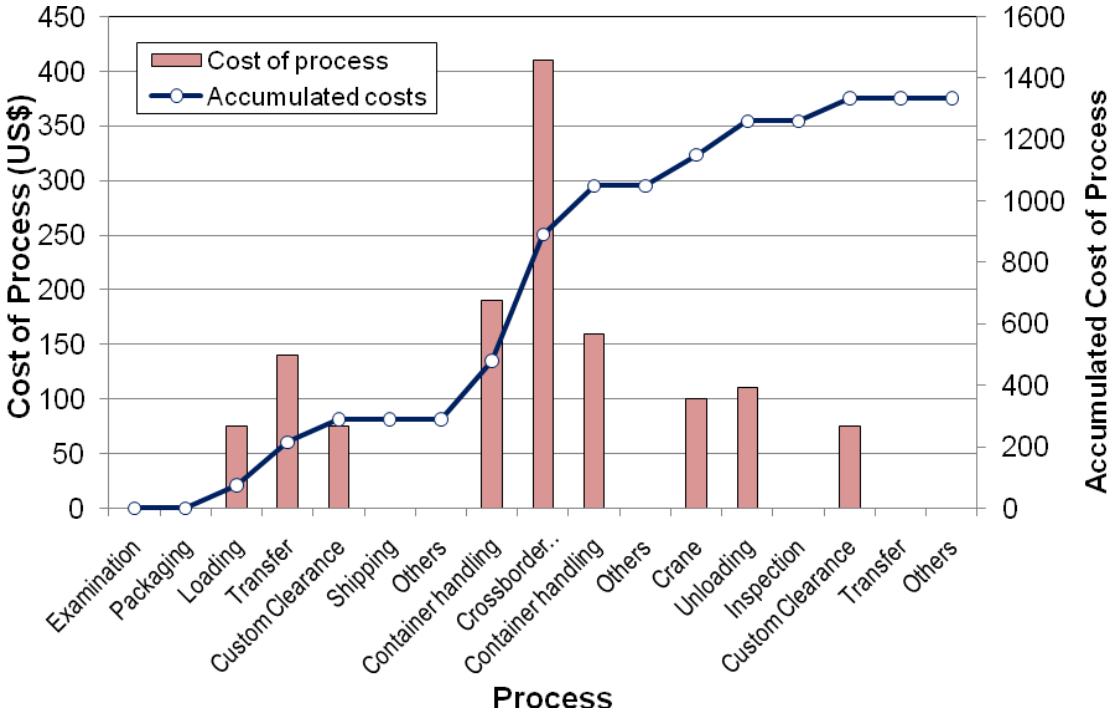
3-3-3. Soft and hard infrastructure

Bottlenecks for service links may be present not only in hard infrastructure such as roads and ports but also in soft infrastructure such as customs procedures, trade facilitation, and regulations governing logistics services. Bottlenecks may exist either at borders or behind borders. Although the CADP places a special focus on hard logistics infrastructure, the importance of effective coordination between soft and hard infrastructure should not be understated.

Links to the improvement of trade and investment regimes are also important. As Corbett and Umezaki (2009) and Urata and Okabe (2010) claim, integration efforts in ASEAN and East Asia have a practical effect on economic activity. This is particularly crucial for Tier 2 countries/regions that try to attract production blocks and participate in production networks.

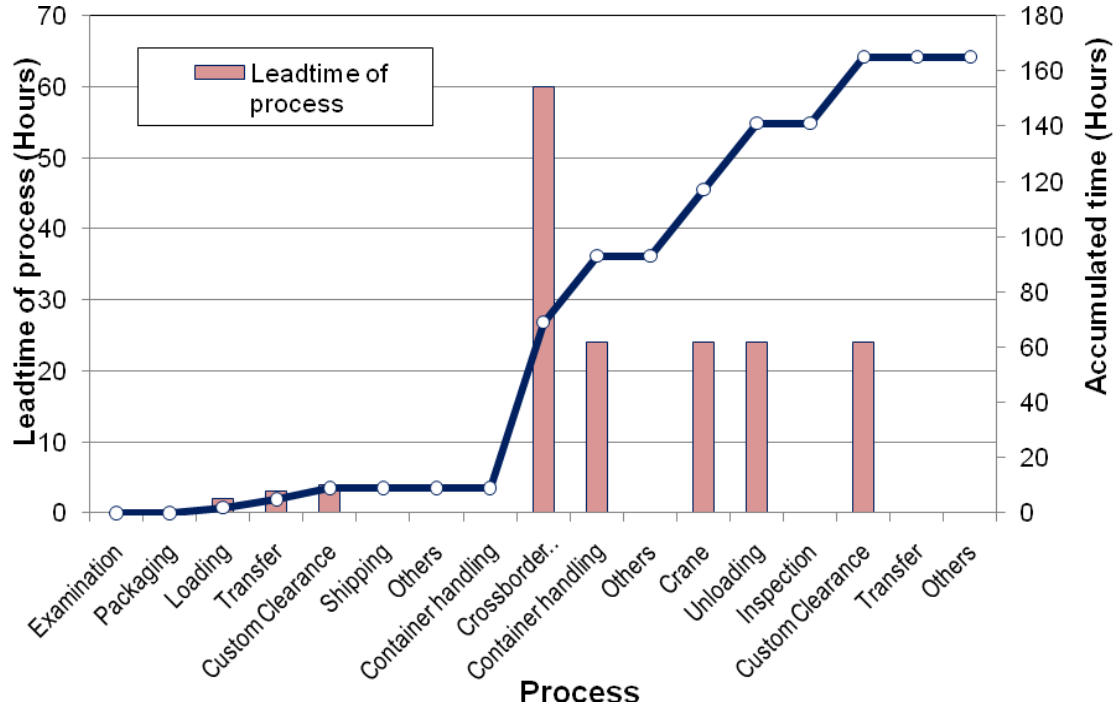
JETRO (2009) conducts a sample survey on logistics cost and time. Figures 3-8 and 3-9 depict logistics costs and time in a case in which automobile parts are transported from Bangkok to Singapore by maritime transport services. Logistics links consist of a number of stages through soft and hard logistics infrastructure, and a bottleneck is present in different phases. What logistics links amounts to a bottleneck varies from case to case.

Figure 3-8. The relation between process and costs (72_Route1_Sea)



Source: JETRO (2009)

Figure 3-9. The relation between process and leadtime (72_Route1_Sea)



Source: JETRO (2009)

Banomyong and Ishida (2010) conducted a semi-structured questionnaire survey on private companies and chambers of commerce in the region and found that logistics infrastructure, particularly soft logistics infrastructure, tends to be a constraint for CLMV to participate in production networks.

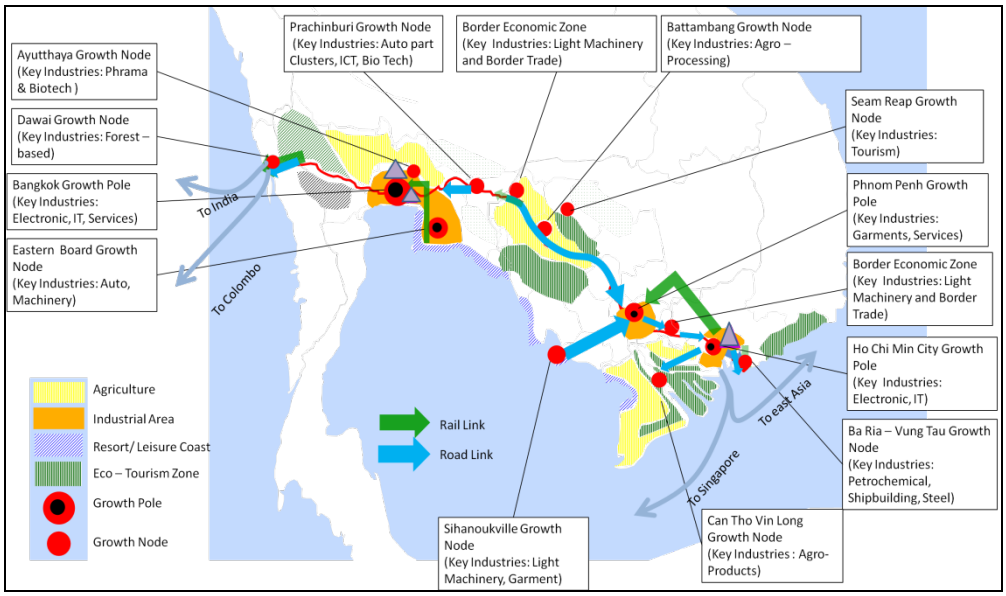
3-3-4. Mekong-India Economic Corridor: a pilot study by ERIA

ERIA conducted a pilot study on the Mekong-India Economic Corridor (MIEC) (ERIA, 2009). The corridor was intended to connect Ho Chi Minh City in Vietnam, Phnom Penh in Cambodia, Bangkok Metropolitan Area and the Eastern Seaboard of Thailand, Dawei in Myanmar, and the east coast of India. This corridor presented particularly good potential for manufacturing activities. The study applied a workable conceptual framework with an extended fragmentation theory and new economic geography, identified bottlenecks in service links and location advantages, and proposed effective coordination among multiple policy modes and various stakeholders in the development of logistics infrastructure and other economic infrastructure.

Figure 3-10 illustrates the overall spatial structure of the MIEC. Bangkok and the Eastern Sea Board of Thailand and Ho Chi Minh City in Vietnam are regarded as Tier 1 while Phnom Penh and other growth nodes correspond to Tier 2. Economic Activities in Tier 1 and Tier 2 generate trickle-down effects on neighboring Tier 3. By properly controlling agglomeration forces and dispersion forces, we can generate constructive interactions among the three tiers and pursue the goals of both deepening economic integration and narrowing development gaps.

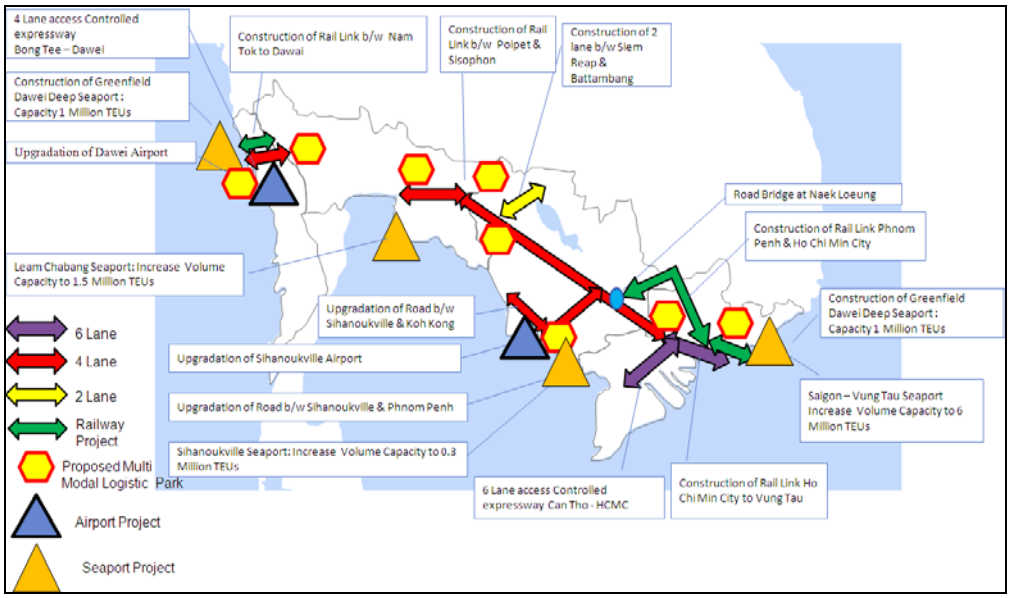
Figure 3-11 presents a list of transportation sector projects. Together with the necessary improvement in soft logistics infrastructure, service-link costs will be reduced, and the region can fully utilize globalizing forces and economic dynamism in its economic development. Actual project ideas are incorporated in our long list of prioritized projects presented in Chapter 6.

Figure 3-10. Growth poles and growth nodes proposed by the ERIA-MIEC project



Source: ERIA (2009).

Figure 3-11. Transportation sector projects proposed by the ERIA-MIEC project



Source: ERIA(2009).

The study suggests that a link to India would have a huge economic impact.[5] The east coast of India would become a significant manufacturing base. By connecting

[5] It is confirmed by the simulation results presented in Chapter 4.

three industrial agglomerations, i.e., Chennai/Bangalore, Bangkok, and Ho Chi Minh City, the manufacturing base in East Asia would surely be strengthened. The connection through Myanmar would be the key to success.

3-3-5. Necessary logistics infrastructure and other economic infrastructure

Infrastructure development for Tier 2 should be concentrated on solving bottlenecks in attracting production blocks. Differences in development stages naturally generate certain location advantages such as the availability of unskilled labor and access to some specific resources. Therefore, by removing bottlenecks, the threshold required to enter production networks can be cleared.

A bottleneck almost always exists in service links. Together with soft logistics infrastructure, hard logistics infrastructure should be developed in order to link with neighboring industrial agglomerations or the world market. Particularly for quick and high-frequency-type production networks, logistics infrastructure must meet three-dimensional quality; i.e., quality in terms of monetary cost, time cost, and reliability.

Location advantages providing a reduction in production cost *per se* sometimes have clear bottlenecks. The most common bottleneck is a stable electricity supply sufficient for manufacturing activities. A basic set of facilities and services on industrial estates or SEZs is also a typical bottleneck.

At the very first stage of industrialization, a country does not have to improve its countrywide investment climate immediately. That is often an overwhelming task. Rather, a country can start by setting up some specific areas such as SEZs and improve the investment climate locally. After successfully attracting a certain number of production blocks, learning from the head start will work effectively in establishing an overall favorable investment climate.

Targets in infrastructure development in Tier 2 are summarized as follows:

(1) Reliable logistics links with neighboring industrial agglomerations or the world market
(2) Other economic infrastructure such as electricity supply to solve bottlenecks in location advantages for manufacturing activities
(3) Industrial estates and SEZs, particularly at the initial stage of industrialization
(4) Coordination with other policy modes to control agglomeration and dispersion forces.

Major sectors of infrastructure development are tabulated in Table 3.4.

Table 3-4. Infrastructure development in Tier 2

Logistics Infrastructure	Other economic infrastructure	Urban and social infrastructure
1. Road / bridges ▸ Middle-distance roads for connecting industrial centers, logistics hubs, and neighboring industrial agglomerations ▸ Sub-urban road system for avoiding congestions **2. Railways** ▸ Development of regional arterial railway networks **3. Ports / maritime** ▸ Upgrading major ports to enhance handling capacity **4. Airports** ▸ Upgrading major airports for both passengers and cargos	**1. Industrial estates / special economic zones** ▸ SEZs in border areas and population centers **2. Energy / power** ▸ Stable and ample supply of electricity and energy for industries **3. Telecommunication** ▸ Development / upgrading of trunk telecommunication networks	**2. Water and sanitation, medical and others** ▸ Improving water and sanitary conditions in urban areas

3-4. Tier 3: Invigorating industrial development by logistics infrastructure

3-4-1. Logistics infrastructure as a trigger

Tier 3 covers countries or regions that are located far from urban centers and often, but not always, have a small population size. In the case of ASEAN, the mountainous areas of Mekong, the islands of East Indonesia and the Southern Philippines are amongst those which fall into this tier.

For these areas, the traditional view has taken static comparative advantage for granted and has often recommended the development of primary industries conditional on the existing status of logistics infrastructure. Such a conservative view, however, does not allow for a break-through in a vicious cycle of small logistics and retarded industrial development. Although these countries/regions may not attract quick, high-frequency-type production networks in the short run, we can provide new perspectives for industrial development by making middle to long-distance logistics connection reliable.

Table 3-5. The 2x3policy matrix for Tier 3

	Reduction in fixed costs to develop production/distribution networks	Reduction in service link costs connecting production blocks	Further costs reduction in production cost per se in production blocks
Fragmentation along the distance axis	Policies to reduce investment costs	Policies to overcome geographical distance and border effects	Policies to strengthen location advantages
	(1) improvement in stability, transparency, and predictability of investment-related policies; (2) investment facilitation in FDI-hosting agencies and industrial estates; and (3) liberalization and development in financial services related to capital investment.	(1) reduction/removal of trade barriers such as tariffs; (2) trade facilitation including simplification and improved efficiency in custom clearance/procedures; (3) development of transport infrastructure and improved efficiency in transport and distribution services; (4) development of telecommunication and ICT infrastructure; (5) improved efficiency in financial services related to operation and capital movements; and (6) reduction in costs of coordination between remote places by facilitation of the movement of natural persons.	(1) establishment of educational/occupational institutions for personnel training to secure various types of human resources; (2) establishment of stable and elastic labor-related laws and institutions; (3) establishment of efficient international and domestic financial services; (4) reduction in costs of infrastructure services such as electricity and other energy, industrial estates services; (5) development of agglomeration to facilitate vertical production chains; (6) establishment of economic institutions such as investment rule and intellectual property rights; and (7) various trade and investment facilitation.
Fragmentation along the disintegration axis	Establishment of economic environment to reduce set-up costs of arm's length transactions	Development of institutional environment to reduce the cost of implementing arm's length transactions	Policies to strengthen competitiveness of potential business partners
	(1) establishment of economic system to allow co-existence of various business partners as well as making various types of contracts; (2) various policies to reduce costs of information gathering on potential business partners; (3) securing fairness, stability, and efficiency in contract; and (4) establishment of stable and effective institutions to secure intellectual property rights.	(1) policies to reduce monitoring cost of business partners; (2) improvement in legal system and economic institutions to activate dispute settlement mechanism; and (3) policies to promote technical innovations in modulation to further facilitate outsourcing.	(1) hosting and fostering various types of business partners including foreign and indigenous firms; (2) strengthening supporting industries; and (3) various policies to promote the formation of agglomeration.

If we provide necessary logistics and other economic infrastructure and establish links with tier 1 and the world market, Tier 3 can also take advantage of globalizing forces in economic development. Here, we can still utilize the mechanics of fragmentation even though transactions are slow and of low-frequency-type. Table 3-5 highlights typical policies required for the industrial development in Tier 3 in red. Indeed, by making logistics links reliable, if not for quick or high-frequency-type services, various types of industrial development can be within reach.

3-4-2. New perspectives for industrial development

Reliable logistics infrastructure provides ample economic opportunities.

Even primary resource-based industries such as agriculture and fisheries can find a number of new business models with reliable physical links to Tier 1 and to the world. For example, agriculture may become a strong export base to improve economies; organic crops and vegetables are possibilities. The fisheries industry could be dramatically strengthened with the introduction of cold storage, ship maintenance facilities, and systems and measures for properly controlling limited resources.

Tourism also offers huge potential. For example, ancient cultural city links can work strongly to attract mass-tourism as well as providing opportunities for learning from neighboring countries, which may establish a solid basis for upgraded tourism. Eco-tourism and adventure tours also have great possibilities.

Mining activities and agricultural plantations may help to underpin further development. We can apply the essence of staples thesis as claimed by the Canadian economic historian Harold Innis.[6] Knowing how to generate active linkages with other industries is the key.

We should not forget labor-intensive industries or labor-intensive production blocks. Some areas in Tier 3 have population masses large enough to support serious manufacturing activities. Resource-based agro-industry can also be a core for industrialization. Working on longer value chains is not always successful but it is certainly worth exploring such possibilities.

The benefit of Indigenous SMEs in developing countries is often overlooked; indeed, those who participate in such ventures are sometimes viewed as needing to be taken care of by social policy and to be valued solely by the employment opportunities they create. However, SMEs in cottage industries or primary product processing can actually play important roles particularly in rural development. They can consist of strong export bases, too.

[6] As for staples theory, Drache (1995) and Watkins (1963) are classical references.

3-4-3. Necessary logistics infrastructure and other economic infrastructure

Even in the context of narrowing development gaps, it would seem advisable to seek strong linkages between logistics infrastructure and industrial development so that both the deepening of economic integration and the narrowing of development gaps can be pursued at the same time. Whenever the situation allows, we should avoid social policies simply for the sake of income redistribution and apply economic policies which take advantage of market forces and invigorate industries.

The demand for logistics infrastructure and logistics services is generated by industrial activity. Infrastructure and industrial activity can be said to have a "Chicken and egg" relationship; if we simply extrapolated current demand for logistics infrastructure, nothing would happen. Logistics infrastructure should work as a trigger for new perspectives of industrial development.

Targets in infrastructure development in Tier 3 are summarized as follows:

(1) Credible small to medium-scale logistics infrastructure to gain access to urban centers and the world market for creative business models

(2) Logistics infrastructure for mining and agricultural plantations to work as staples of economic development

(3) Effectively utilize green endowments

(4) Seizing opportunities for manufacturing activities

Major sectors of infrastructure development are tabulated in Table 3-6.

Table 3-6. Infrastructure development in Tier 3

Logistics Infrastructure	Other economic infrastructure	Urban and social infrastructure
1. Road / bridges ▸ Long-distance road connection and rural road networks for various industrial development ▸ Sub-urban road system for avoiding congestions **2. Railways** ▸ Middle-distance railways for resource-based industries **3. Ports / maritime** ▸ Upgrading of local ports **4. Airports** ▸ Upgrading / development of local airports	**1. Industrial estates / special economic zones** ▸ Industrial estates in growth nodes **2. Energy / power** ▸ Development of power plants taking advantage of location advantages ▸ Local supply of electricity and energy **3. Telecommunication** ▸ Local telecommunication networks	**1. Water and sanitation, medical and others** ▸ Improving water and sanitary conditions

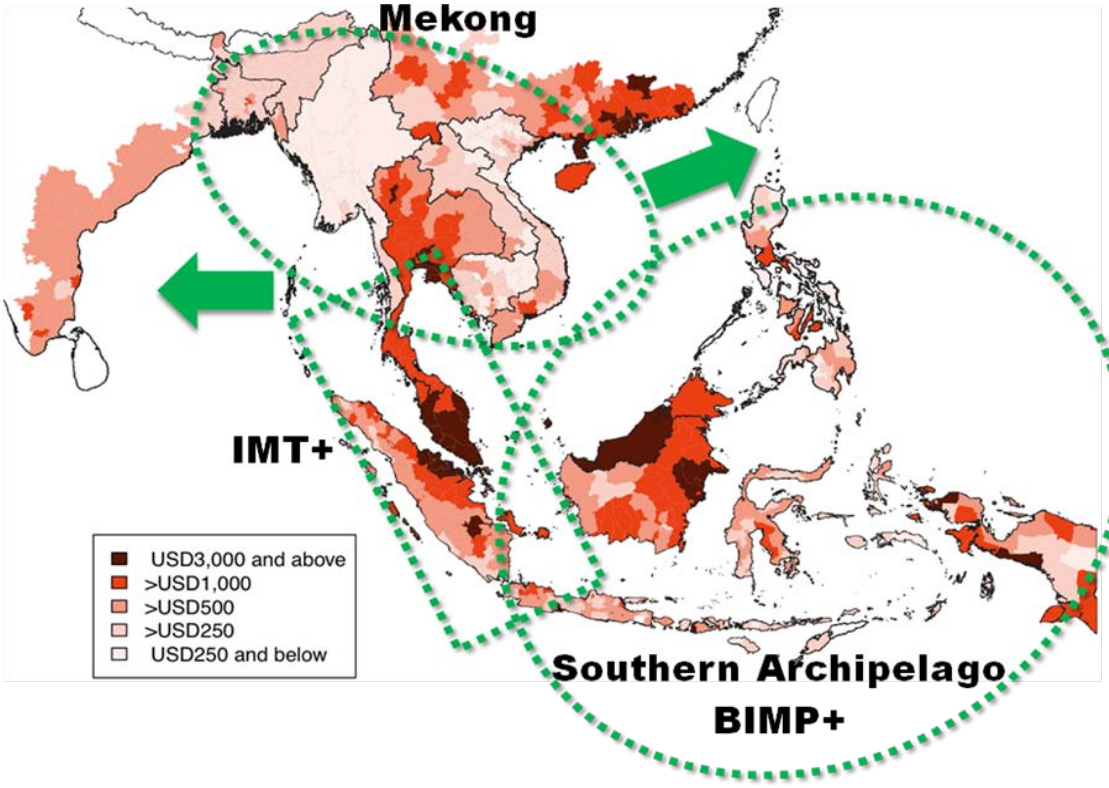
3-5. Interaction among three tiers: Three sub-regions and industrial/economic corridors

Our conceptual framework based on the extended fragmentation theory and new economic geography stresses the importance of interaction among the three tiers. The extended fragmentation theory calls for a reduction in service-link costs so that fragmentation of production occurs across tiers. New economic geography infers the importance of controlling agglomeration forces and dispersion forces by combining trade cost reduction with supplementary improvement of location advantages.

To encourage interaction among the three tiers, the CADP introduces three broad sub-regions in ASEAN: Extended Mekong Sub-region, IMT+ Sub-region, and BIMP+ Sub-region (Figure 3-12). Each sub-region is designed to cover a wider geographical range than the existing framework in order to include Tier 1, Tier 2, and Tier 3 and pursue both the deepening of economic integration and the narrowing of development gaps. It is often assumed that urban development and rural development cannot take place at the same time or that governments must make a choice between prioritizing one or the other. We believe, however, that these two forms of development should go hand-in-hand in order to be mutually beneficial. By developing efficient and innovative industrial agglomerations in Tier 1, the development of Tiers 2 and 3 can be accelerated. Development strategies for the three tiers must be cohesive and interactive.

There are multiple industrial/economic corridors in each sub-region. There are a large number of existing “corridors” in our development efforts, and all of these try to emphasize some sort of linkage across regions. The CADP particularly emphasizes the importance of industrial/economic corridors that connect regions at different stages of participation in production networks. In the Extended Mekong Sub-region, the Mekong-India Economic Corridor (MIEC) is an example of this. In IMT+ Sub-region, the Eastern Sumatra-North Western Java Corridor connected with Malaysia could be a good candidate. In BIMP+ Sub-region, the Northern Java Corridor must be in one of the first-round attempts. In the design and implementation of industrial/economic corridors, interaction and feedback among the three tiers as well as coordination among policy modes and stakeholders must be properly addressed.

Figure 3-12. Three sub-regions



Source: ERIA / IDE-JETRO GSM Team

3-6. Other considerations in planning and implementation

The CADP provides a cohesive framework for infrastructure development and industrialization in considering large disparities in stages of development. It does not however intensively discuss all of the issues necessary for planning and implementation of infrastructure development. Indispensable aspects for discussion are as follows.

First, the CADP does not explicitly investigate project feasibility in the context of macroeconomic management and fiscal sustainability. We do not expect policymakers and donors to be overwhelmingly risk-averse in its planning. Rather than extrapolating current trends, East Asia can have invigorating perspectives for further economic development once we establish a workable conceptual framework. Nevertheless, strict checking on the impact of development projects on macroeconomic management and fiscal sustainability is essential.

Second, it is important for people in countries in the region to be positive about participating in and feel ownership of development strategies, rather than simply following policies formulated by specific donors or international organizations.

Project implementation, particularly for cross-border projects, must be conducted so as to nurture regional identity.

Third, sustainability of environmental and perishable resource endowments must be comprehensively considered. While the economic value of the environment may differ between regions and peoples, a certain level of assessment of the environmental impacts is a must for all projects. Logistics infrastructure projects and other economic infrastructure projects surely impose certain burdens on the environment in the process of both project implementation and its consequences. The magnitude of environmental impacts differs widely due to the nature of projects, the location, and the method of implementation. Although we do not have a proper framework or sufficient statistical information at the macro level, we must pay serious attention to possible environmental impacts at the project planning stage.

CHAPTER 4.

ECONOMIC ASSESSMENT OF THE CADP: THE GEOGRAPHICAL SIMULATION MODEL

The Geographical Simulation Model (GSM) developed by a team of researchers from the Institute of Developing Economies, Japan External Trade Organization (IDE-JETRO) has been a primary device in quantifying the economic impacts of logistics improvement in accordance with the conceptual framework of the CADP. The simulation model will be referred to as the IDE/ERIA-GSM hereinafter. The IDE/ERIA-GSM is an extended version of the Core-Periphery Model (Krugman, 1991) to incorporate multiple industrial sectors and intermediate goods. The third generation of the IDE/ERIA-GSM was developed in a supporting study project for the CADP, and the description in this chapter is largely based on Kumagai, et al (2010).

4-1. Geographical Simulation Model (GSM)

4-1-1. Development of the IDE/ERIA-GSM

The IDE/ERIA-GSM has been in development since 2007 when 16 research institutes in EAS member countries launched several test-run projects under the initiative towards the establishment of ERIA. The primary objective of the IDE/ERIA-GSM is to investigate the dynamics of the location of populations and industries in East Asia in the long run. Although there have been many undertakings to make macroeconomic forecasts at the national level, except for a very limited amount of literature, there has been no analysis using spatial simulation models to investigate economic development in East Asia at the subnational level. In view of deepening regional economic integration and significant disparities within countries, economic analyses at the national level are insufficient to provide useful information for regional economic cooperation. The second objective is to analyze the economic impacts of specific infrastructure projects on the regional economy at the subnational level. It is difficult to prioritize various infrastructure development projects without a proper and objective evaluation device.

The first-generation IDE/ERIA-GSM was published in Kumagai *et al* (2008a, 2008b), as a result of an ERIA test run project on "International Infrastructure Development in East Asia: Towards Balanced Regional Development and

Integration." Focusing on the Greater Mekong Subregion (GMS), the first-generation IDE/ERIA-GSM covered 220 subnational regions in 8 countries, connected with 457 road links. And the regional GDP was divided into 3 broad industrial sectors; agriculture, manufacturing, and services.

The most notable departure of the second-generation IDE/ERIA-GSM was made in sectoral disaggregation (Kumagai, *et al* 2009). By disaggregating the manufacturing sector into 5 subsectors, the second-generation IDE/ERIA-GSM contains seven sectors: (1) agriculture, (2a) automotive, (2b) electric and electronics, (2c) textile and garments, (2d) food processing, (2e) other manufacturing, and (3) services. This development enabled us to make more precise investigations into the impacts of infrastructure development with respect to each industrial sector. In addition, the second-generation IDE/ERIA-GSM expanded the geographical scope including 361 subnational regions in 10 countries, connected with 693 road links. The geographical focus was still on the GMS, and the mode of transportation was limited to road transportation.

The third-generation IDE/ERIA-GSM made a significant development by incorporating maritime and air transportation, and a realistic mechanism of modal choice. This development enabled us to expand the geographical scope of the model to include all ASEAN member States. As a result, the number of subnational regions increased to 956, spanning 13 countries. The number of routes increased dramatically to 2,648, which comprised 1,890 road links, 488 sea links, and 270 air links.

4-1-2. The third-generation IDE/ERIA-GSM

(1) Basic features

The IDE/ERIA-GSM has been developed as an economic geography model for the purpose of predicting the impacts of infrastructure development projects on the economy at the subnational level. The third-generation IDE/ERIA-GSM differs from the second-generation version in the following points: (1) geographic coverage has been expanded to cover ASEAN 10, Bangladesh, and parts of China and India, and (2) it incorporates realistic modal choice among land, sea, and air transport. These improvements enable better analysis of a wider variety of scenarios and provide more reliable results.

The third-generation IDE/ERIA-GSM is a cutting-edge economic model that incorporates realistic geography and modal choice. Various analyses show that the economic impacts of logistics infrastructure developments are somewhat complicated and differ significantly by industry. Development plans should thus be carefully designed and, to that end, an analytical device like the IDE/ERIA-GSM has much to

contribute.

The third-generation IDE/ERIA-GSM confirms that regional infrastructure development projects would benefit most regions along corridors and near ports and airports. However, large-scale infrastructure development may widen existing income gaps, i.e., rich regions may become richer and poor regions may become poorer. In particular, intranational economic gaps may widen during the phase of economic development, given the restrictions on the international mobility of the labor force..

We should be very cautious when considering regional infrastructure development because the economic improvement of all involved regions is not automatically assured. The regions affected by an infrastructure development project are often wider than one may imagine. An infrastructure development project might create winning regions/industries and losing regions/industries, and could lead to quite drastic modal shifts for certain origin-destination combinations. As a result, there is a possibility of under- or over-unitization of specific roads/ports/airports. Thus, we need to design infrastructure development projects taking due account of the impacts on wider regions and on other modes of transport. It is thus a sensible policy option to establish an international body to coordinate regional transport infrastructure development projects

As discussed in Chapter 1, the Comprehensive Asia Development Plan (CADP) aims to provide a grand spatial design of economic infrastructure and industrial placement, with a claim that we can pursue both the deepening of economic integration and the narrowing of development gaps at the same time. The IDE/ERIA-GSM, sharing common theoretical underpinnings with the CADP, can be a powerful device to verify the claim of the CADP, by quantifying the economic impacts of transport/logistic infrastructure development.

(2) Agglomeration and dispersion forces in the IDE/ERIA-GSM

In the IDE/ERIA-GSM, infrastructure development and trade facilitation measures are used as policy instruments. These policies are input to the model in terms of reduction in the time and money costs to connect subnational regions. In the conceptual framework of the CADP, these costs are termed as service link costs. The reduction of service link costs connecting a region to others will reduce the cost of purchasing intermediate goods to be used in the region, and increase the demand for the goods produced in the region. Through both channels, the profits of firms operating in the region are expected to grow.

Once the profits of firms in a region increase, more firms will be attracted to operate in that region. And the increase in the number of firms operating in the region will further reduce costs for part procurement, thereby providing those firms with a

greater chance to increase their profits. This is a form of agglomeration forces. The higher profit will enable firms to pay higher wages to their employees, and the higher wages will attract more people to work in the region. The increased population will enlarge the market size of the region. The bigger market will enable firms in the region to increase their profits. This is the second form of agglomeration forces.

On the other hand, dispersion forces will work in the following way. The more firms are operating in a region, the more competition the firms have to face. Fierce competition will have negative impacts on the firms' profits. Besides that, more demand in a region will raise the price levels in the region, and lower real wages in the region. These negative pressures on firms' profits and real wages will persuade firms and workers to move out of the region, in search of regions with less competition and lower price levels, respectively. This is a form of dispersion forces built in the IDE/ERIA-GSM.

(3) Modal choice

As already mentioned, the third-generation IDE/ERIA-GSM includes 956 subnational regions in 13 countries, and these subnational regions are connected with 2,648 transport links consisting of 1,890 road links, 488 sea links, and 270 air links. In the IDE/ERIA-GSM, all of these links are incorporated with a reasonable mechanism of modal choice. In the model, each firm decides the route and mode of transport taking into account both money and time costs. The IDE/ERIA-GSM adopts the modal mix that minimizes the total transport costs and calculates an iceberg-like transport parameter, dividing minimum transport costs by the standardized value of the goods by industry.

(4) Transport Costs

In the third-generation IDE/ERIA-GSM model, transport costs are dealt with in a completely different way compared with the past two models, where the traditional "iceberg" transport costs were assumed. First, we calculate the money-equivalent transport costs of transporting one 20-foot container by industry and mode, for every origin-destination combination. Then, we calculate the percentage of these transport costs against the value of one 20-foot container filled with the following goods, namely, automotive products, electrical and electronic products, textile and garments, food, and other manufactured goods. This number is treated as T_{ijkm} , the transport costs between city i and j for goods k by mode m.

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(5) Labor Mobility

Parameters on labor mobility are set on three levels, namely, international labor mobility (γ_N), intra-national, or intercity labor mobility (γ_C), and inter-industry labor mobility (γ_I) within a region. If γ=0.1, it means that a country/region/industry with two times higher real wages than the average attracts a 10 percent labor inflow a year. The IDE/ERIA-GSM assumes γ_N=0, γ_C =0.02, and γ_I=0.05. These assumptions mean respectively that international migration of labor is prohibited, that a region with two times higher real wages than the national average induces a 2 percent labor inflow a year, and that an industrial sector with two times higher real wages than the average in the region induces a 5 percent labor inflow from other industrial sectors in a year.

(6) Limitations

Despite a number of promising features of the IDE/ERIA-GSM, there still remain several limitations to be noted here. First of all, the sources of economic growth in the third-generation IDE/ERIA-GSM are still limited to population growth, domestic migration (inter-regional and inter-sectoral), and impacts of infrastructure development. In order to quantify the impacts of infrastructure development in terms of value, it is necessary to make specific assumptions on the parameters for broadly defined technological progress. And the value is highly dependent on the assumption, which will require us to conduct much more extensive study. *Ad hoc* assumptions will only lead to unreliable results. Therefore, in the next sub-section, we will demonstrate the simulation results in terms of the percentage ratio of cumulative effects on regional GDP over 10 years (2011-2020) vis-à-vis the baseline level of regional GDP in 2010. At this point, this normalization is the only available and justifiable way to demonstrate the simulation results from the IDE/ERIA-GSM.

Secondly, the IDE/ERIA-GSM has not yet incorporated railways and inland waterways, which have played a significant role in specific regions. According to JETRO (2009), the share of inland waterways in total freight volume was about 42% in Myanmar (2003), 20% in Lao PDR (2005) and Vietnam (2004), and the share of railways was about 35% in Myanmar (2003), although it should be noted the data are old and far from complete. In addition, there remains more to do to improve the data for existing modes of transportation, particularly in air and sea transportation. As a result, the modal choice in the current version of the IDE/ERIA-GSM tends to choose routes that use the minimum distance to transport goods while disregarding the "hubness" of nearby ports/airports.

Thirdly, although an aspect of trade facilitation measure is incorporated in terms of the time and money costs for international transaction, non-tariff barriers (NTBs) are

not introduced in the model. NTBs have become a focus of policy discussion particularly in ASEAN, reflecting the significant progress made in tariff reduction under AFTA. In order to highlight this issue, the IDE/ERIA-GSM needs to be updated to incorporate NTBs to enable us to investigate the impacts of broadly defined trade and transport facilitation measures. This again requires much more extensive study.

Fourthly, by allowing domestic migration in response to infrastructure development, we implicitly assume that other economic infrastructure, such as electricity and water, are available to meet the demands of economic activity. In reality, however this is not the case. Therefore, in interpreting the results from the IDE/ERIA-GSM, we need to pay particular attention to the additional requirements for the development of other economic infrastructure.

Last but not least, the data set used in the simulation is still far from perfect in terms of precision and accuracy. The third-generation IDE/ERIA-GSM requires a number of detailed statistics such as regional GDP in 956 subnational regions with 7 sectors and employment in each sector in each subnational region, which is not readily available for most of the countries in the model. In order to pursue informed policymaking in regional cooperation, it is expected that EAS member countries would cooperate to compile a unified geo-economic data set. EUROSTAT offers a very challenging but promising example.

4-2. Economic effects of logistics enhancement: simulation results

This section presents simulation results based on IDE/ERIA-GSM, in terms of the cumulative gains in regional GDP for 10 years (2011-2020) after transport cost reductions as a percentage difference from the baseline level of regional GDP in 2020.

Before examining the details, it should be noted that the simulation analyses presented here intend to examine the economic effects of logistic enhancement in terms of the reduction in money and time costs to connect various regions, instead of the impacts of specific infrastructure projects such as road improvement, highway development, upgrading of ports, and so on. In addition, the simulation scenarios do not incorporate the economic impacts of other policy measures, such as the development of power plants, special economic zones, trade and investment liberalization, and so on. Moreover, as mentioned in the last sub-section, the IDE/ERIA GSM is not designed to forecast economic growth. Therefore, the simulation results presented in this sub-section should be regarded as distributional impacts of hypothetical logistics enhancement.

4-2-1. Scenarios

(0) Baseline

Population growth and migration (labor mobility)

- The national population of each country is assumed to increase at the rate forecasted by the United Nations Population Fund (UNFPA) until year 2025;
- There is no immigration between the region covered in the simulation and the rest of the world.
- There is no international immigration between countries in the model.
- Domestic migration, both inter-region and inter-sectoral, is allowed depending on the difference in real wages.

Land transportation

- The average speed of land traffic is set at 38.5 km/h. However, the speed for passing through a mountainous area is halved or set at 19.25 km/h.

Sea transportation

- The average speed is set at 14.7 km/h between international-class ports, and at half of that among other routes.
- International-class ports: Port Singapore, Port Madras, Port Hong Kong, Port Saigon, Port Jakarta, Port Manila, Port Laem Chabang, and Port Kelang.
- The average speed between Port Singapore and Port Hong Kong is set at 39.4km/h, double the usual average speed, considering the "hubness" of the two ports.
- We introduced RO-RO vessels between some sea routes in the Philippines and Indonesia. The average speed is set at 14.7 km/h, and waiting time is 2 hours and costs 100USD.

Air transportation

- The average speed is set at 800 km/h between the primary airports of each country and at half of that among other routes.
- Primary airports: Brunei, Changi (Singapore), Hong Kong, Kuala Lumpur, Ninoy Aquino (Manila), Soekarno Hatta (Jakarta), Suvarnabhumi (Bangkok), Phnom Penh, Yangon, Wattay (Vientiane), Noi Bai (Hanoi), and Tansonnhat (Ho Chi Minh).

Time and money costs for transaction

- At national borders, the following time and money are assumed to be required by transport mode.

	Time cost (Hours)	Money cost (USD)
Land	13.22	500
Sea	14.97	504
Air	12.81	1,308

- To use the sea and air routes, the following time and money are assumed to be required even if it is an intra-national transaction.

	Time cost (Hours)	Money cost (USD)
Sea	11.67	190

	Air	9.01	690
(1a)	East West Economic Corridor (EWEC)		
	● The overhead time consumed at three borders, i.e., Myawadi (Myanmar) – Mae Sot (Thailand), Mukdahan (Thailand) – Khanthabuly (Lao PDR), and Densavanh (Lao PDR) – Lao Bao (Vietnam), is reduced to two hours. In addition to that, the money costs of transiting these borders are reduced to 100USD, one-fifth of the baseline scenario. ● The average speed on EWEC is set at 60km/h.		
(1b)	East-West Economic Corridor: Missing Link (EWEC-ML)		
	● The average speed on the missing link of EWEC, i.e., Myawadi– Mawlamyine (Myanmar), is set at 60km/h.		
(2)	North South Economic Corridor (NSEC)		
	● The overhead time consumed at five borders, i.e., Mohan-Boten, Tachilek-Mae Sai, Chiang Khong-Houayxay, Hekou-Lao Cai, and Mongla-Daluo, is reduced to two hours. The money costs of transiting these borders are reduced to 100USD, one-fifth of the baseline scenario. In addition to that, the quality of the road in Myanmar along NSEC is upgraded to the same level as the other NSEC routes. ● The average speed on NSEC is set at 60km/h.		
(3a)	Mekong-India Economic Corridor (I): A Mekong Bridge in Neak Loueng		
	● The bridge over the Mekong River at Neak Loueng is constructed.		
(3b)	Mekong-India Economic Corridor (II): Ho Chi Minh to Dawei		
	● The bridge over the Mekong River at Neak Loueng is constructed. ● Dawei and Kanchanburi in Thailand are connected by road, and customs facilitation along MIEC is introduced. This reduces time overheads incurred at three borders (Kanchanburi–Dawei, Ban Khlong Luek–Poipet, and Bavet–Moc Bai) to two hours while the money costs incurred in going through these borders are reduced to 100USD, one-fifth of the baseline scenario.		
(3c)	Mekong-India Economic Corridor (III): Full Spec		
	● The bridge over the Mekong River at Neak Loueng is constructed. ● Dawei and Kanchanburi in Thailand are connected by road, and customs facilitation along MIEC is introduced. This reduces time overheads at three borders (Kanchanburi–Dawei, Ban Khlong Luek–Poipet, and Bavet–Moc Bai) to two hours while the money costs incurred in transiting these borders are reduced to 100USD, one-fifth of the baseline scenario. ● We connect Dawei and Port Madras by a sea route that is equivalent to the other routes between internationally important ports. ● The average speed on the land part of MIEC is set at 60km/h.		
(4)	Three Corridors in Mekong (3ECs)		
	● Implement the EWEC, NSEC and MIEC at the same time.		

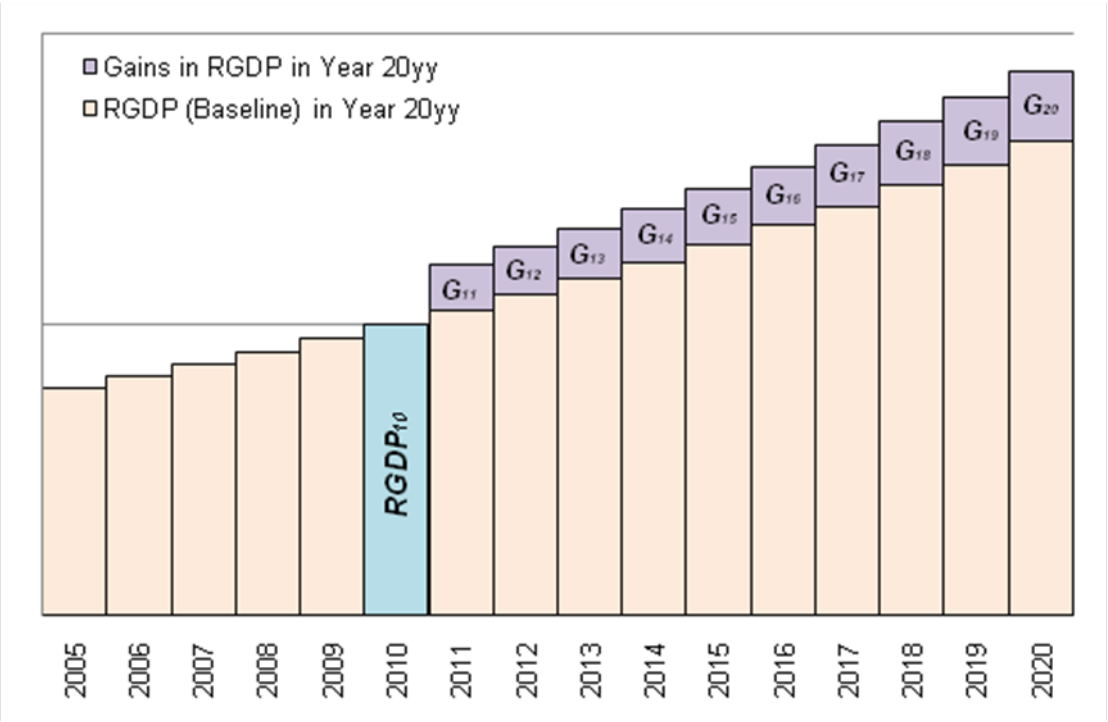
(5)	IMT+
	● The highway, on which vehicles can run at 60 km/h, starts at Bandar Aceh and goes through the eastern part of Sumatra Island ending at Jakarta. At the Sunda Strait, the speed of RO-RO vessels connecting Bakaheuni and Merak are doubled to 39.4km.h, and the waiting time and cost are reduced to 1 hour and 50USD respectively. ● Port Belawan-Port Penang and Port Dumai-Port Malacca, are connected by RO-RO vessels.
(6)	BIMP+ (Ring)
	● The land routes between Jakarta and Surabaya, and Manila-Davao are upgraded, meaning cars can run on them at 60 km/h. ● The sea routes of Manila-Singapore-Jakarta are upgraded, meaning the average speed is set at 22.5km.h, 1.5 times that of the other internationally important sea routes, and the time and money costs at the ports are reduced to half of the baseline scenario. ● The sea routes of Davao-Manado, Manado-Surabaya, Makassar-Surabaya and Balikpapan-Surabaya are also upgraded, meaning the speed is doubled and border costs (time and money) are reduced to half of the original baseline scenario. ● The speed of RO-RO vessels connecting three sea routes in the Philippines are doubled to 39.4km.h, and the waiting time and cost are reduced to 1 hour and 50USD respectively.
(7)	All-corridors
	● Implement the EWEC, NSEC and MIEC, IMT-GT and the Ring route at the same time.

4-2-2. Simulation results

This subsection presents simulation results based on the scenarios specified above. The economic effect of an infrastructure project is measured as the percentage ratio of cumulative gains in regional GDP over 10 years (2011-2020), after the completion of the scenarios of infrastructure development and trade facilitation in 2010, vis-à-vis the baseline level of regional GDP in 2010. In other words, the economic effect is calculated as follows.

$$\text{Economic Effect}\ (\%) = \frac{\sum_{y=11}^{20} G_{yy}}{RGDP_{10}}$$

Figure 4-1. Measuring economic effects in GSM: An illustration



(1) East West Economic Corridor (EWEC)

Figure 4-2-1a illustrates the economic effect of the East West Economic Corridor (EWEC) over 10 years after the implementation of the set scenario.

As illustrated in Figure 4-2-1a and Table 4-2-1a, all regions along EWEC gain although the size of the impacts tends to be larger in lower-income regions, such as Khammouan (166.2%) and Xekong (116.2%) in Lao PDR, Taninthayi (96.0%) and Mon in Myanmar (95.8%). In addition, we observe that the positive impacts spread far beyond the regions adjacent to EWEC, including all regions in Myanmar and some regions in China, Malaysia, and Indonesia. On the other hand, it should be noted that the number of regions affected negatively by the EWEC (611 out of 956 regions) is much greater than those which enjoy positive impacts (345 regions). However, as the magnitude of the negative impacts is much smaller than that of the positive impacts, the total economic effect in the regions covered in this analysis is positive, 0.78%.

In terms of countries, Myanmar gains most (44.3%), followed by Lao PDR (27.3%), Thailand (20.8%) and Vietnam (7.5%). Indeed, most countries are worse off, including a neighboring country, Cambodia (-0.3%)[1].

[1] For China and India, the economic effect is calculated as the sum of economic effects in the regions covered by the IDE/ERIA-GSM, as indicated in Figure 4-2-1a.

In reality, most parts of the EWEC are already developed, mainly under the Greater Mekong Subregion (GMS) program led by the Asian Development Bank (ADB). In order to obtain a clearer insight, we also investigated the economic effect of the development of the missing link along the EWEC, namely, the section between Myawadi and Mawlamyine in Myanmar.

As shown in Figure 4-2-1b, positive economic impacts can be observed mainly in Myanmar. Most of the top 10 gainers are regions in Myanmar, such as Mon (77.2%), Taninthayi (77.1%), and Kayin (51.1%). Indeed, with only this infrastructure development, Myanmar would enjoy significant positive impacts amounting to 36.3%. In this scenario, we can again observe wide diffusion of the economic impacts, although the magnitudes are much smaller than in the case of EWEC as a whole. Reflecting upon the small but negative impacts on a large number of regions, the total economic effect on the whole region would fall into negative territory, -0.11%.

Again, the number of regions positively affected under this scenario is smaller than those negatively affected, while the size of positive impact on the region is generally larger than that of negative impacts. These findings imply that the economic effects of infrastructure development should be evaluated from a wider point of view taking due account of the economic chain reaction. In other words, in designing infrastructure development plans in ASEAN and surrounding regions to pursue both the deepening of economic integration and the narrowing of development gaps, it is important to consider multiple economic corridors.

Figure 4-2-1a. Economic effects of EWEC

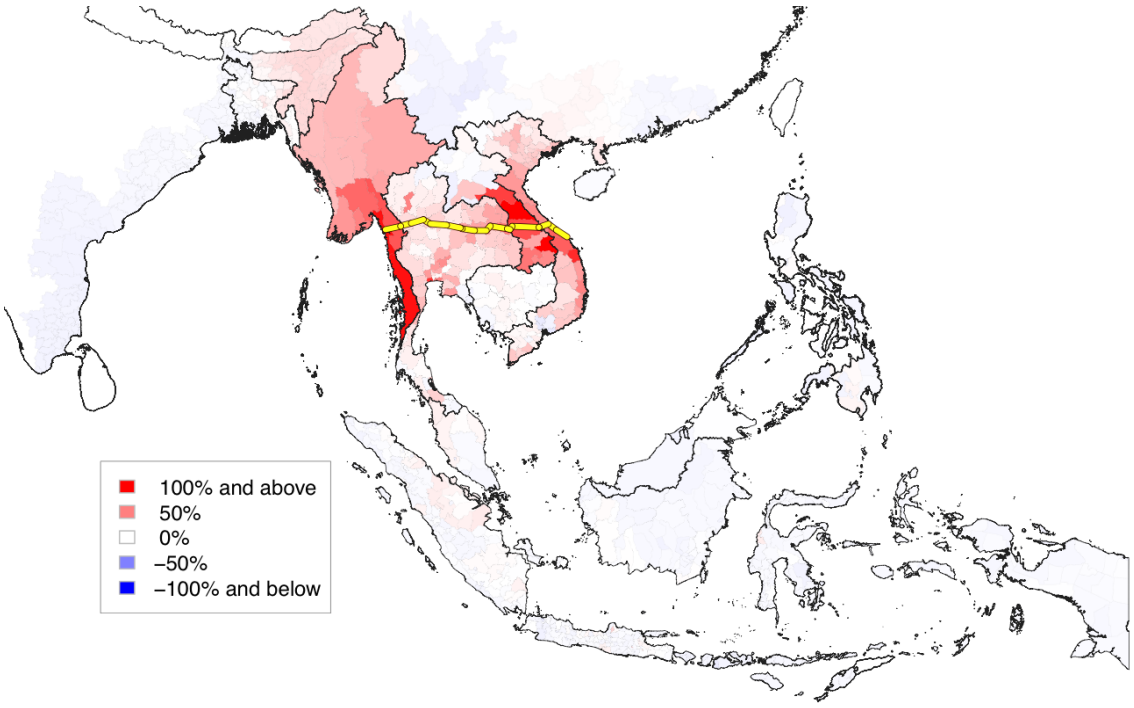


Table 4-2-1a. Ranking of economic effects: EWEC

EWEC				
Ranking by Region			Ranking by Country	
Region	Country	Economic Effects	Country	Economic Effects
Khammouan	Lao PDR	166.2%	Myanmar	44.3%
Xekong	Lao PDR	116.2%	Lao PDR	27.3%
Taninthayi	Myanmar	96.0%	Thailand	20.8%
Mon	Myanmar	95.8%	Vietnam	7.5%
Samut Sakhon	Thailand	88.6%	Bangladesh	0.9%
Quang Ngai	Vietnam	85.7%	Malaysia	0.8%
Bolikhamxai	Lao PDR	78.8%	Cambodia	-0.3%
Savannakhet	Lao PDR	71.5%	Indonesia	-2.2%
Kayin	Myanmar	67.8%	India	-2.4%
Da Nang City	Vietnam	67.0%	Philippines	-2.5%
Number of regions with	100% or more	2	China	-2.7%
	50% to 100%	17	Singapore	-4.2%
	0% to 50%	326	Brunei	-4.4%
	Less than 0%	611	Hong Kong	-4.6%
Total Economic Effect in 956 Regions		0.78%	Macao	-4.7%

Figure 4-2-1b. Economic Effects of EWEC (Missing Link)

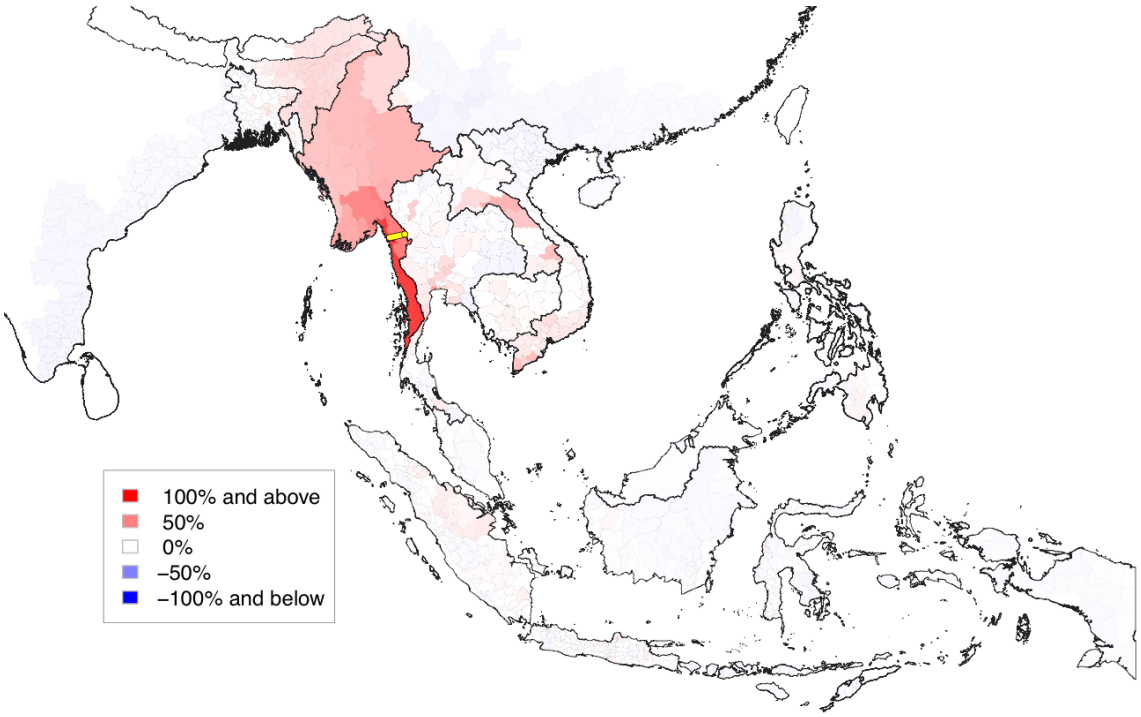


Table 4-2-1b. Ranking of economic effects: EWEC (missing link)

EWEC-ML				
Ranking by Region			Ranking by Country	
Region	Country	Economic Effects	Country	Economic Effects
Mon	Myanmar	77.2%	Myanmar	36.3%
Taninthayi	Myanmar	77.1%	Thailand	5.6%
Kayin	Myanmar	51.1%	Lao PDR	5.5%
BAGO	Myanmar	47.6%	Vietnam	4.4%
Samut Sakhon	Thailand	40.8%	Bangladesh	1.7%
Yangon	Myanmar	38.8%	Cambodia	1.3%
Ayeyawaddy	Myanmar	33.7%	Philippines	-0.1%
Kayar	Myanmar	31.0%	Indonesia	-0.4%
Bolikhamxai	Lao PDR	30.6%	Malaysia	-0.5%
Shan	Myanmar	29.4%	India	-1.6%
Number of regions with	100% or more	0	China	-2.1%
	50% to 100%	3	Singapore	-2.3%
	0% to 50%	343	Brunei	-2.6%
	Less than 0%	610	Macao	-2.7%
Total Economic Effect in 956 Regions		-0.11%	Hong Kong	-2.7%

(2) North South Economic Corridor (NSEC)

Figure 4-2-2 illustrates the economic effects of the North-South Economic Corridor (NSEC). Again, regions along the NSEC gain more, but the positive economic effects spreads to a wider area beyond the corridor. However, compared to the case of EWEC, strong economic effects are more concentrated near the borders of China and Lao PDR. Bokeo (113.5%) in Lao PDR would gain most, followed by Yuxi (112.7%) and Licang (95.3%) in China, and Lamphun (94.5%) in Thailand. In terms of individual country gains, Myanmar gains the most (22.5%), followed by Lao PDR (19.1%) and Thailand (9.4%).

In recognition of the fact that a large number of regions and countries would be negatively affected, the total economic effect of NSEC is negative, -0.43%.

Figure 4-2-2. Economic effects of NSEC

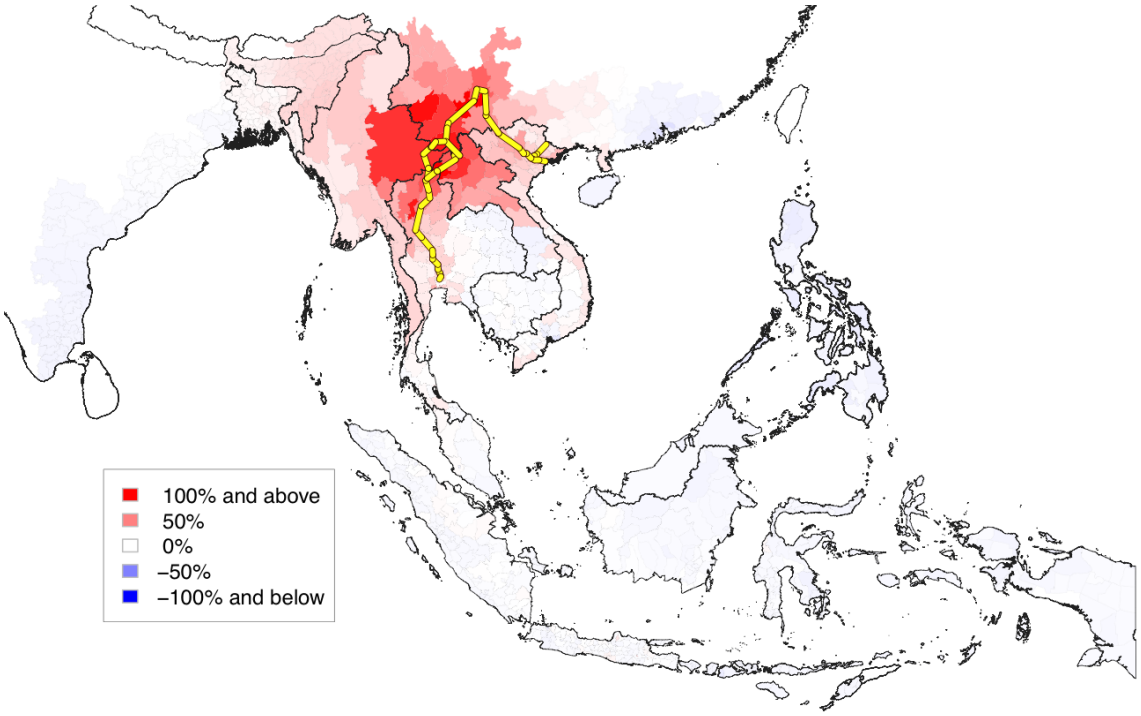


Table 4-2-2. Ranking of economic effects: NSEC

NSEC				
Ranking by Region			Ranking by Country	
Region	Country	Economic Effects	Country	Economic Effects
Bokeo	Laos	113.5%	Myanmar	22.5%
Yuxi	China	112.7%	Laos	19.1%
Lincang	China	95.3%	Thailand	9.4%
Lamphun	Thailand	94.5%	Bangladesh	4.0%
Xishuangbanna Dai	China	91.9%	Vietnam	3.1%
Oudomxai	Laos	84.3%	China	1.0%
Shan	Myanmar	82.0%	Malaysia	-0.6%
Simao	China	78.0%	India	-1.3%
Chiang Rai	Thailand	68.4%	Indonesia	-1.5%
Phongsali	Laos	67.1%	Cambodia	-2.2%
Number of regions with	100% or more	2	Singapore	-3.8%
	50% to 100%	14	Brunei	-4.2%
	0% to 50%	337	Philippines	-5.9%
	Less than 0%	603	Hong Kong	-9.8%
Total Economic Effect in 956 Regions		-0.43%	Macao	-9.8%

(3) Mekong India Economic Corridor (MIEC)

Figures 4-2-3a to 4-2-3c illustrate the economic effects of the Mekong-India Economic Corridor (MIEC), connecting Ho Chi Minh City, Phnom Penh, Bangkok, and Dawei by road, and further to Chennai (Madras) in India by sea route. MIEC is an extended version of the Southern Economic Corridor (SEC) as defined by ADB, with the objective of exploring more impacts by widening the scope of regional economic integration.

Compared to EWEC and NSEC, MIEC is more relevant to the conceptual framework of the CADP in the sense that it includes existing and emerging industrial agglomerations along the corridor, namely, Ho Chi Minh City, Bangkok, and Chennai. As discussed in Chapter 2, in order to pursue the deepening of economic integration and the narrowing of development gaps at the same time, it is important to utilize two opposite forces of globalization, namely, agglomeration forces and dispersion forces. In order to make this mechanism work effectively, an economic corridor should be designed to include regions at different development stages, that is, those with a different endowment of economic resources. In between the above mentioned industrial agglomerations, MIEC passes through lower-income regions such as Cambodia and Dawei in Myanmar. In this regard, MIEC is a good example to

examine the validity of the conceptual framework of the CADP.

As often discussed, an economic corridor is only as strong as its weakest link. There still remains a lot to do to explore the full potential of MIEC by enhancing weak links. First of all, a long-awaited Mekong Bridge in Neak Loung (Cambodia) should be regarded as a top priority. Secondly, as it is being developed under bilateral cooperation between Thailand and Myanmar, it is important to open an effective means of access from Bangkok to the Andaman Sea, by upgrading the road connecting Kanchanaburi (Thailand) and Dawei (Myanmar). Thirdly, a comprehensive development project should be designed for Dawei, including a deep sea port and special economic zones. In particular, a deep sea port in Dawei will provide vast opportunities for the firms operating in the surrounding region by opening up a new logistics route to India, the Middle East, and Europe. In addition, this development is expected to reduce congestion in the Malacca Strait. All in all, the full spec MIEC can be regarded as a multimodal economic corridor, or a land bridge, passing through the Indochina Peninsular.

Let us take a closer, step-by-step look at the economic effects of MIEC. Figure 4-2-3a illustrates the impact of a bridge over the Mekong River in Neak Loung. Currently, in order to travel from Phnom Penh to Ho Chi Minh City along the Cambodian national road No.1, trucks have to make a stop at the Mekong River and take a ferry across the river. No matter how efficiently the ferry is operated, it is clearly much more time-consuming for trucks to make this crossing by ferry than it would be to use a bridge. The 10 regions which will benefit the most from the bridge are Cambodian regions such as Svay Rieng (2.49%), Prey Veng (2.33%), and Phnom Penh (2.06%). These are the regions along MIEC, i.e., national road No.5 in Cambodia. However, about half of the regions in Cambodia, those along and to the north of national road No.6, are expected to be negatively affected. The total economic effect in Cambodia is still positive, 1.104%.

Although the Mekong Bridge in Neak Loung can be developed as a national project in Cambodia, the economic effects would spread to neighboring countries. Vietnam and Lao PDR gain 0.097% and 0.063% respectively. In this scenario, the number of regions negatively affected is 298, much smaller than the 658 positively impacted regions. As a result, the total economic effect on the region as a whole is 0.014% greater than the level expected when considering the size of the development project. This implies that the lack of a bridge over the Mekong River in Neak Loung is in fact a significant bottleneck in ASEAN and surrounding regions, instead of being merely a bottleneck in Cambodia. All regions are connected through various transport links. Once a regional bottleneck is identified, it should be addressed as a regional

initiative even when the bottleneck is wholly located in a specific country.

Figure 4-2-3b illustrates the economic effects of the second phase of MIEC, namely, an enhanced road connection from Ho Chi Minh City to Dawei. The overall benefits for the wider region are much greater if compared to the first phase. Taninthayi in Myanmar (247.7%) gains most, followed by Soc Trang (176.2%), Ca Mau (165.1%), and Bac Lieu (121.0%) in Vietnam, Samut Sakhon (109.3%) in Thailand and Phnom Penh (104.1%) in Cambodia. Under this scenario, Cambodia can expect to receive positive impacts on all regions in the country.

The economic effects at the national level are also significant; Cambodia (69.9%), Myanmar (59.0%), Vietnam (54.9%), and Thailand (24.7%). Although the positive impact on Vietnam as a whole is large, the impacts would be unevenly diffused. The northern part of Vietnam is expected to be negatively affected, at the expense of the significant gains made in the southern part of the country. Lao PDR gains as well, but the size of the impact is much smaller than in the case of EWEC and NSEC. The total economic effect in the regions under study is 4.31%, much larger than in the case of EWEC and NSEC.

Figure 4-2-3c illustrates the economic effects of the full specification of MIEC. The size of the impacts will be magnified further. Taninthayi in Myanmar, the region surrounding Dawei, gains most (272.9%), followed by Soc Trang (203.8%) and Ca Mau (191.5%) in the southern part of Vietnam. In terms of the benefits for individual countries, Cambodia gains most (76.5%), followed by Myanmar (66.0%), Vietnam (63.5%), Thailand (38.8%), and Lao PDR (14.5%). Regions in India under study are also expected to gain significantly.

On the other hand, Singapore is expected to be worse off (-3.5%) as a result of transport diversion effects. The development of MIEC would indeed reduce congestion in the Malacca Strait. Again, the impacts of infrastructure development would be diffused unevenly.

The total economic effect on the 956 regions under study is 7.82%, much larger than other scenarios such as EWEC and NSEC.

Figure 4-2-3a. Economic effects of MIEC (I): A Mekong bridge in Neak Loung

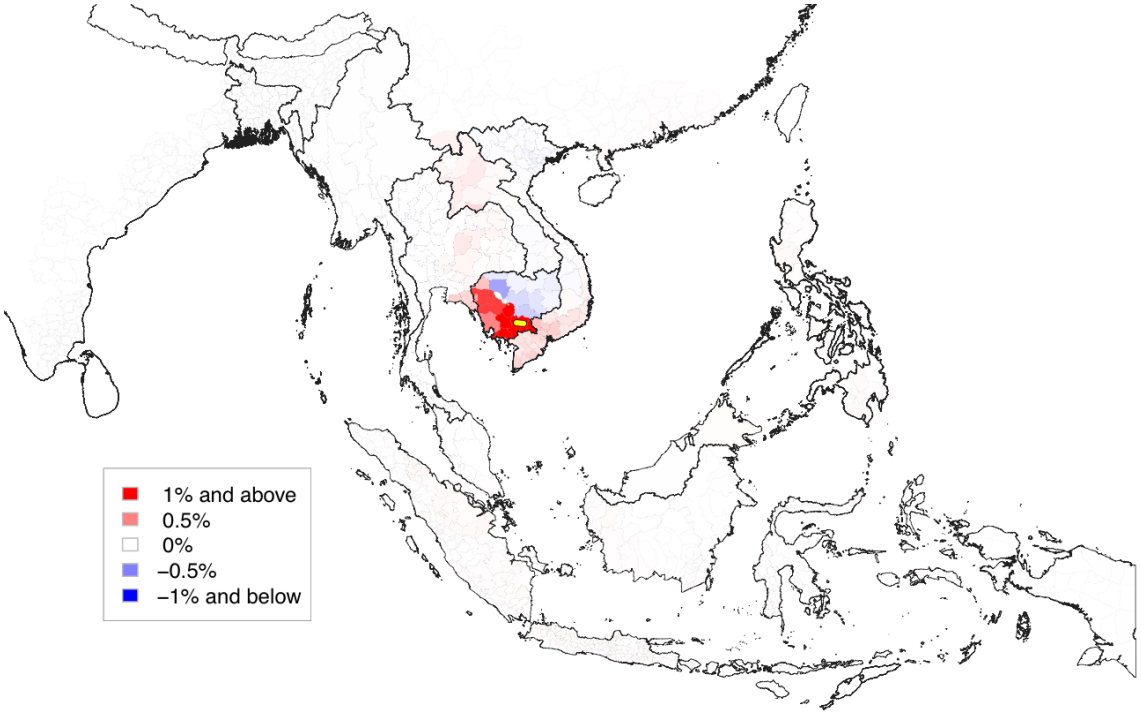


Table 4-2-3a. Ranking ofeconomic effects of MIEC (I)

MIEC(I)				
Ranking by Region			Ranking by Country	
Region	Country	Economic Effects	Country	Economic Effects
Svay Rieng	Cambodia	2.49%	Cambodia	1.104%
Prey Veng	Cambodia	2.33%	Vietnam	0.097%
Phnom Penh	Cambodia	2.06%	Lao PDR	0.063%
Kandal	Cambodia	1.83%	Philippines	0.013%
Kampong Chhnang	Cambodia	1.34%	Thailand	0.012%
Kampong Speu	Cambodia	1.25%	Indonesia	0.012%
Takeo	Cambodia	1.23%	China	0.006%
Kampot	Cambodia	1.07%	Brunei	0.006%
Sihanoukville	Cambodia	0.98%	Hong Kong	0.004%
Pursat	Cambodia	0.77%	Myanmar	0.004%
Number of regions with	100% or more	0	Macao	0.002%
	50% to 100%	0	Malaysia	0.002%
	0% to 50%	658	Singapore	0.001%
	Less than 0%	298	India	0.001%
Total Economic Effect in 956 Regions		0.014%	Bangladesh	0.000%

Figure 4-2-3b. Economic effects of MIEC (II): From Ho Chi Minh to Dawei

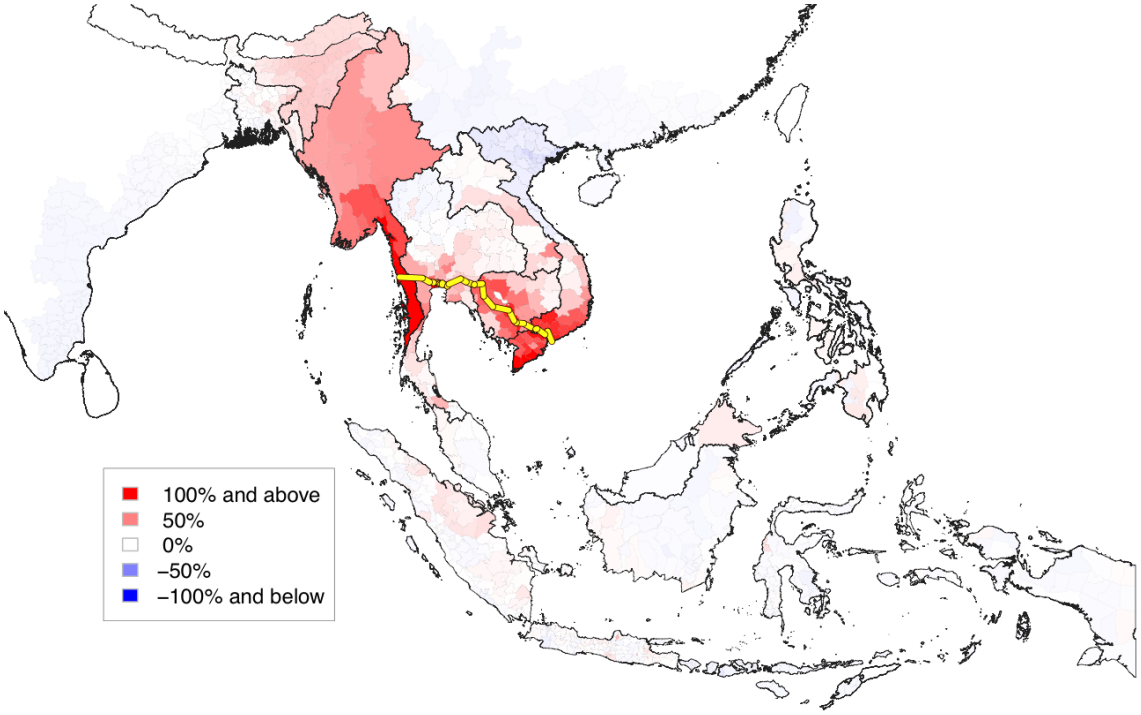


Table 4-2-3b. Ranking of economic effects: MIEC (II)

MIEC(II)				
Ranking by Region			Ranking by Country	
Region	Country	Economic Effects	Country	Economic Effects
Taninthayi	Myanmar	247.7%	Cambodia	69.9%
Soc Trang	Vietnam	176.2%	Myanmar	59.0%
Ca Mau	Vietnam	165.1%	Vietnam	54.9%
Bac Lieu	Vietnam	121.0%	Thailand	24.7%
Samut Sakhon	Thailand	109.3%	Lao PDR	5.2%
Phnom Penh	Cambodia	104.1%	Bangladesh	4.0%
Mon	Myanmar	101.3%	Philippines	0.8%
Long An	Vietnam	96.3%	Malaysia	0.3%
Ba Ria-Vung Tau	Vietnam	95.3%	Indonesia	0.1%
Kandal	Cambodia	92.8%	India	-0.9%
Number of regions with	100% or more	7	China	-2.0%
	50% to 100%	36	Brunei	-2.7%
	0% to 50%	372	Hong Kong	-3.1%
	Less than 0%	541	Macao	-3.2%
Total Economic Effect in 956 Regions		4.31%	Singapore	-3.6%

Figure 4-2-3c. Economic effects of MIEC (III): Full spec

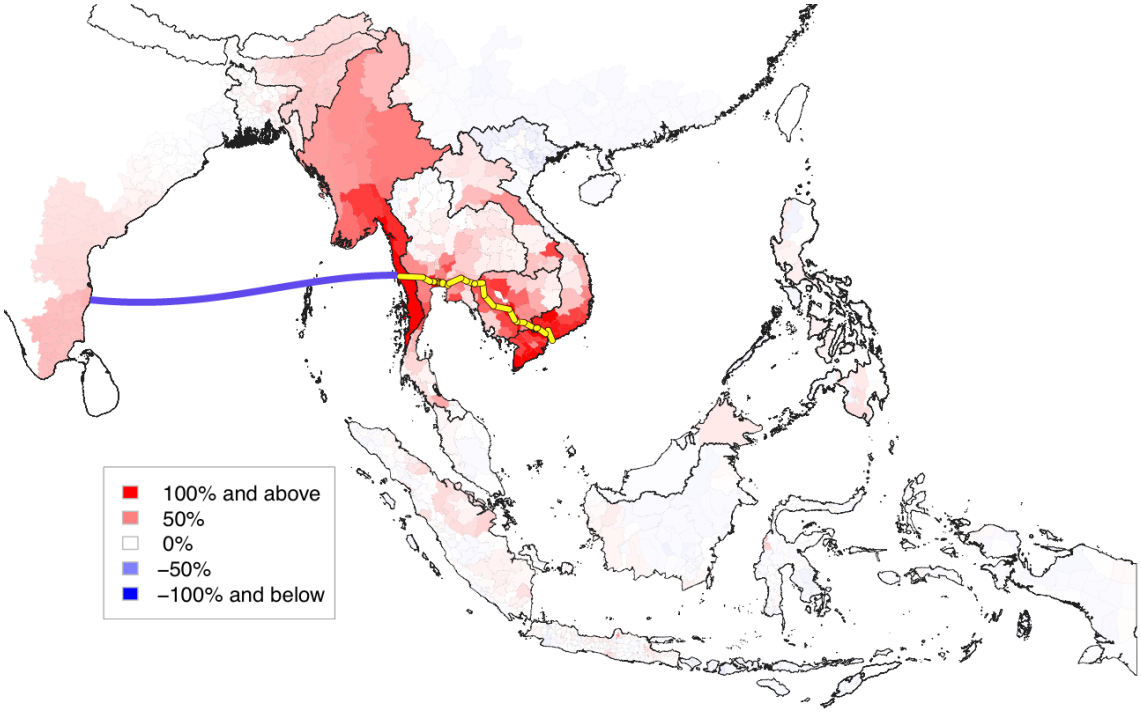


Table 4-2-3c. Ranking of economic effects: MIEC (III)

MIEC(III)				
Ranking by Region			Ranking by Country	
Region	Country	Economic Effects	Country	Economic Effects
Taninthayi	Myanmar	272.9%	Cambodia	76.5%
Soc Trang	Vietnam	203.8%	Myanmar	66.0%
Ca Mau	Vietnam	191.5%	Vietnam	63.5%
Samut Sakhon	Thailand	157.8%	Thailand	38.8%
Bac Lieu	Vietnam	140.2%	Lao PDR	14.5%
Mon	Myanmar	114.8%	India	13.4%
Phnom Penh	Cambodia	112.0%	Bangladesh	4.6%
Long An	Vietnam	109.1%	Philippines	1.7%
Ba Ria-Vung Tau	Vietnam	105.6%	Indonesia	0.8%
Binh Phuoc	Vietnam	104.3%	Malaysia	0.4%
Number of regions with	100% or more	11	China	-2.0%
	50% to 100%	41	Brunei	-2.5%
	0% to 50%	488	Hong Kong	-2.9%
	Less than 0%	416	Macao	-3.3%
Total Economic Effect in 956 Regions		7.82%	Singapore	-3.5%

(4) Three Economic Corridors in Indochina Peninsular (3ECs)

Figure 4-2-4 illustrates the economic effects of three economic corridors in the Indochina Peninsular, EWEC, NSEC, and MIEC.

Although the total economic effect on the whole region is significant (6.24%), the size of the impacts is smaller than in the case of MIEC alone. This is because some of the economic effects of a specific economic corridor can be cancelled out by other economic corridors. Considering the expense of implementing the scenarios under consideration, "doing everything" is not always the best strategy. Rather, it is important to design a grand spatial plan of infrastructure development taking due account of concentration on weak links in the region.

Figure 4-2-4. Economic effects of 3ECs

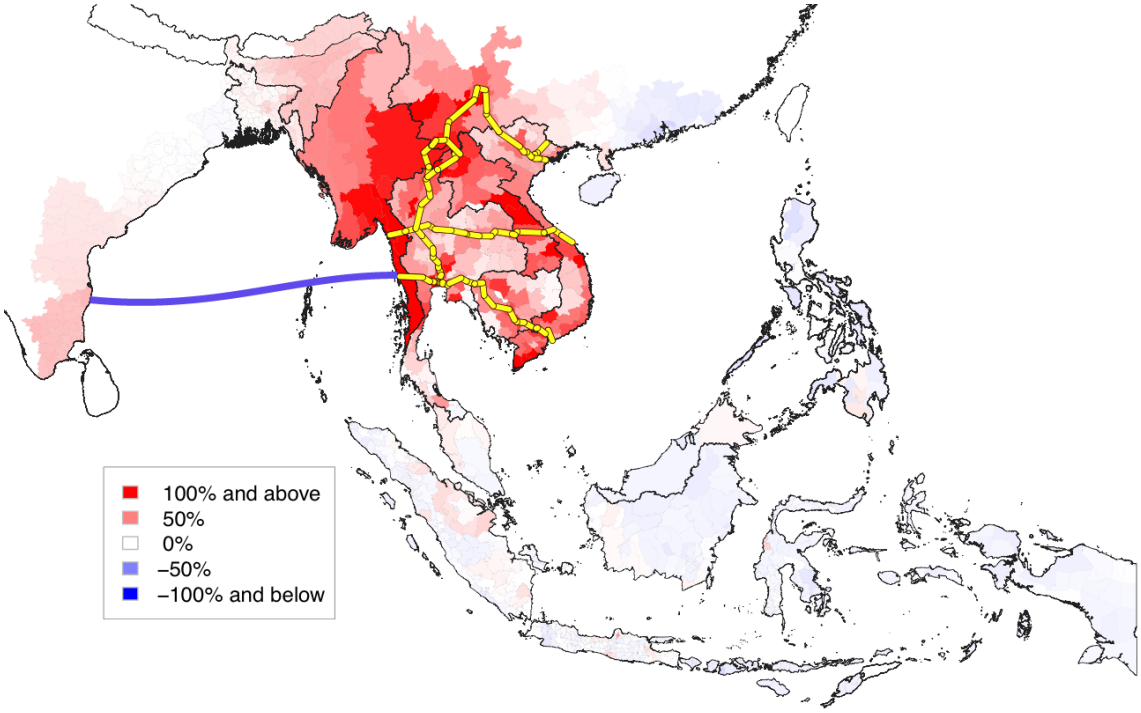


Table 4-2-4. Ranking of economic effects: 3ECs

3ECs				
Ranking by Region			Ranking by Country	
Region	Country	Economic Effects	Country	Economic Effects
Taninthayi	Myanmar	250.0%	Myanmar	82.1%
Khammouan	Laos	195.6%	Cambodia	54.7%
Samut Sakhon	Thailand	194.1%	Lao PDR	50.9%
Soc Trang	Vietnam	176.9%	Thailand	49.6%
Ca Mau	Vietnam	166.5%	Vietnam	49.3%
Xekong	Laos	163.6%	India	12.8%
Mon	Myanmar	142.6%	Bangladesh	7.3%
Lamphun	Thailand	129.9%	Malaysia	1.1%
Bokeo	Laos	127.5%	China	-1.9%
Bolikhamxai	Laos	120.0%	Indonesia	-2.1%
Number of regions with	100% or more	16	Philippines	-6.4%
	50% to 100%	66	Singapore	-7.8%
	0% to 50%	428	Brunei	-8.1%
	Less than 0%	446	Hong Kong	-13.9%
Total Economic Effects in 956 Regions		6.24%	Macao	-14.4%

(5) IMT+

Figure 4-2-5 illustrates the economic effect of the IMT+ corridor[2]. As shown in the Figure 4-2-5 and Table 4-2-5, Sumatra Island benefits very significantly under this scenario through better access to relatively richer regions in Malaysia and Thailand.

The top 10 gainers are all regions in Indonesia, namely, Kota Lholseumawe (470.6%), Kota Pematang (328.3%), Siak (325.3%), Asahan (323.3%), and Kota Medan (321.5%). However, considering its geographical size and nature as an archipelagic country, the total economic effect on Indonesia as a whole is rather moderate, 20.1%. In terms of the economic effect at the national level, Malaysia gains most, 38.6%, followed by Myanmar (21.1%).

The total economic effect in all regions under study is 16.24%, much larger than that under the scenarios of economic corridors in the Indochina Peninsular. Most notably, the economic effect of the IMT+ corridor is expected to spread more evenly than the three corridors in the Indochina Peninsular. Indeed, all countries under study will be better off from this scenario as shown in Table 4-2-5. The number of regions negatively affected by this scenario is only 36 out of 956. This is because all ports in the region are, in effect, connected to sea routes. Therefore, enhancement in sea routes can have greater impacts as compared to enhancement in road infrastructure.

[2] "IMT+" is a concept of sub-region, wider than the Indonesia-Malaysia-Thailand Growth Triangle (IMT-GT), in the sense that it considers the connections with neighboring industrial agglomerations such as Bangkok and Jakarta.

Figure 4-2-5. Economic effects of IMT+ corridor

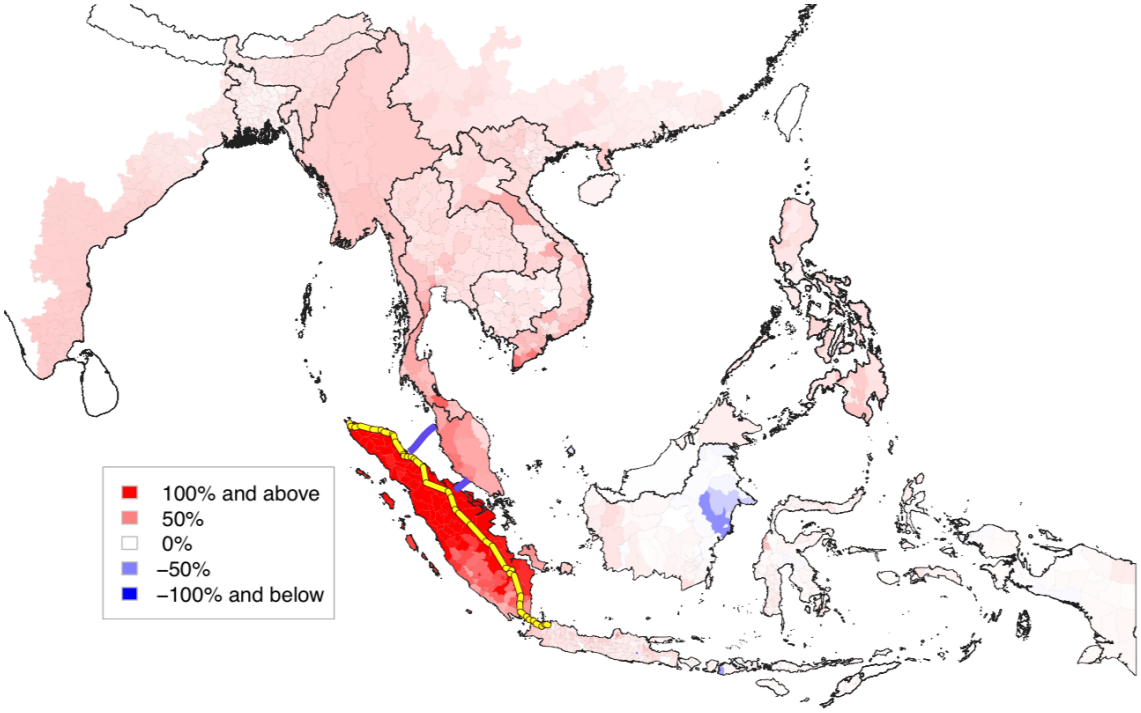


Table 4-2-5. Ranking of economic effects: IMT+ corridor

IMT+				
Ranking by Region			Ranking by Country	
Region	Country	Economic Effects	Country	Economic Effects
Kota Lhokseumawe	Indonesia	470.6%	Malaysia	38.6%
Kota Pematang Siantar	Indonesia	328.3%	Myanmar	21.1%
Siak	Indonesia	325.3%	Indonesia	20.1%
Asahan	Indonesia	323.3%	Thailand	19.3%
Kota Medan	Indonesia	321.5%	Vietnam	19.3%
Kota Tanjungbalai	Indonesia	298.6%	Lao PDR	17.6%
Kota Binjai	Indonesia	297.4%	Singapore	17.3%
Rokanhilir	Indonesia	286.9%	India	16.2%
Deli Serdang	Indonesia	282.7%	Cambodia	15.7%
Bengkalis	Indonesia	282.4%	Philippines	12.0%
Number of regions with	100% or more	75	Hong Kong	11.1%
	50% to 100%	42	Macao	10.5%
	0% to 50%	803	China	8.4%
	Less than 0%	36	Bangladesh	7.4%
Total Economic Effects in 956 Regions		16.24%	Brunei	4.3%

(6) BIMP+ (Ring Route)

Figure 4-2-6 illustrates the economic effect of the BIMP+ (Ring) corridor[3]. The economic effect is quite significant, amounting to 30.52%. In particular, regions in Sulawesi Island are expected to gain significantly. Again, the top 10 gainers are all regions in Indonesia, namely, Kota Kediri (655.5%), Mamuju Utara (417.2%), Kota Bitung (370.2%), Kota Makasar (361.2%), and Kudus (292.7%). Sulawesi Island, Kota Makasar in particular, is expected to function as the core of economic development in Eastern Indonesia and narrow the development gaps in Indonesia. In this respect, it is important to first promote the economic development of Sulawesi Island, by opening up effective access to neighboring regions. Even though the economy of Sulawesi Island is dominated by the primary sector, better access to large markets is expected to open a new perspective of development strategy in the region

In addition, regions in Mindanao Island in the Philippines gains significantly, namely, Region XII, Soccsksargen (210.9%), Region X, Northern Mindanao (140.6%), and Region XIII, Caraga (105.1%). This will also provide an opportunity to narrow the development gaps in the Philippines.

Similar to IMT+, the economic effect of the BIMP+ (Ring) corridor is expected to be diffused more evenly. All countries are better off, and the number of regions affected negatively is only 9 out of 956.

[3] "BIMP+" is a concept of sub-region, wider than the Brunei Darussalam-Indonesia-Malaysia-the Philippines East ASEAN Growth Area (BIMP-EAGA), in the sense that it considers the connections with neighboring industrial agglomerations such as Singapore, Jakarta, Surabaya and Manila.

Figure 4-2-6. Economic effects of BIMP+(Ring) corridor

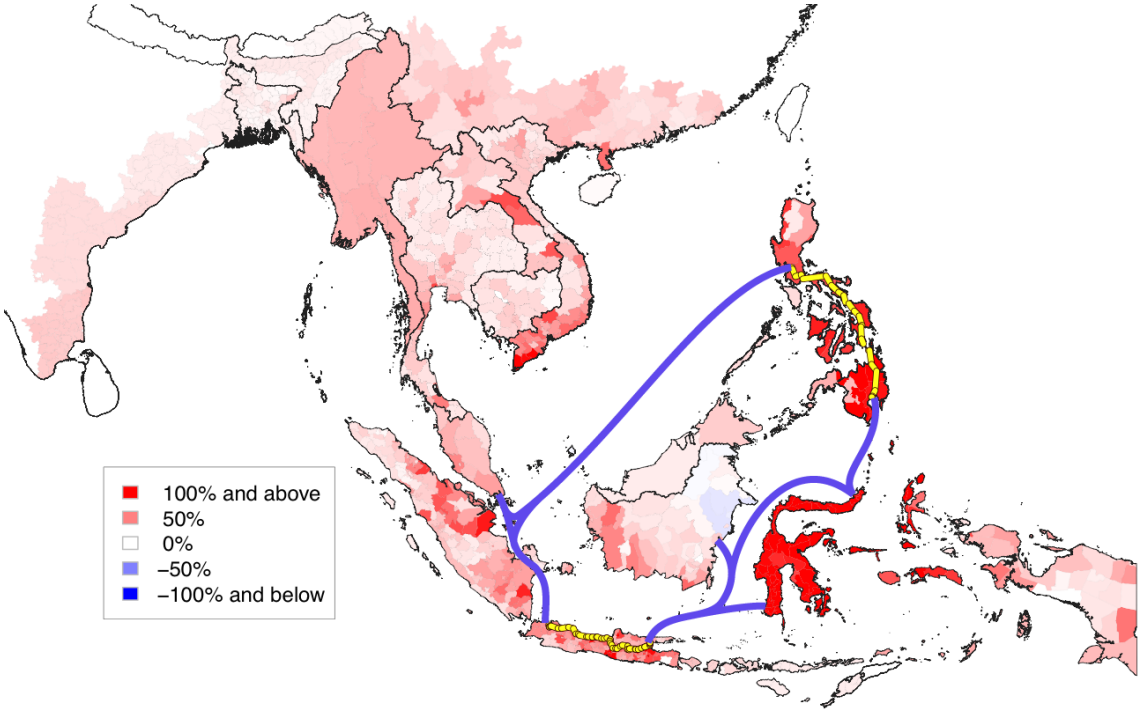


Table 4-2-6. Ranking of economic effects: BIMP+(Ring) corridor

BIMP+ (Ring Route)				
Ranking by Region			Ranking by Country	
Region	Country	Economic Effects	Country	Economic Effects
Kota Kediri	Indonesia	655.5%	Indonesia	65.7%
Mamuju Utara	Indonesia	417.2%	Philippines	63.4%
Kota Bitung	Indonesia	370.2%	Vietnam	38.7%
Kota Makasar	Indonesia	361.4%	Myanmar	30.6%
Kudus	Indonesia	292.7%	Malaysia	28.1%
Minahasa Selatan	Indonesia	232.8%	Thailand	23.6%
Minahasa	Indonesia	230.1%	Lao PDR	22.5%
Bonebolango	Indonesia	223.7%	Singapore	18.7%
Kota Palu	Indonesia	214.9%	China	18.6%
Kota Kendari	Indonesia	212.9%	Cambodia	18.2%
Number of regions with	100% or more	79	India	13.9%
	50% to 100%	104	Hong Kong	10.7%
	0% to 50%	764	Macao	8.0%
	Less than 0%	9	Bangladesh	6.9%
Total Economic Effects in 956 Regions		30.52%	Brunei	5.8%

(7) All corridors

Figure 4-2-7 illustrates the economic effect of all corridors we have considered so far, namely, EWEC, NSEC, MIEC, IMT+, and BIMP+. The total economic effect is magnified further to 54.77%.

In terms of the benefits for individual countries, Myanmar gains the most (145.8%), followed by Vietnam (114.6%), Lao PDR (99.3%), Thailand (98.6%), Cambodia (97.9%), Indonesia (85.0%), the Philippines (73.4%), and Malaysia (64.4%). The most important point to note here is that, except for Thailand, the size of the positive impact is expected to be larger in lower-income countries. This finding can be regarded as supporting evidence to claim that these economic corridors can contribute to the narrowing of development gaps.

Most of the regions benefit significantly. 254 regions out of 956 will gain more than 100%, and 239 regions gain between 50% and 100%. The number of regions affected negatively is only 17, mainly those in East Kalimantan and some parts of Papua province. These regions have mining-based economies, which have higher GDP in the baseline scenario. The improvement of the infrastructure in other parts of Indonesia reduces some inflow of labor from these mining-based economies, leading to the slightly decreased regional GDP compared with the baseline scenario.

Figure 4-2-7. Economic effects of all corridors

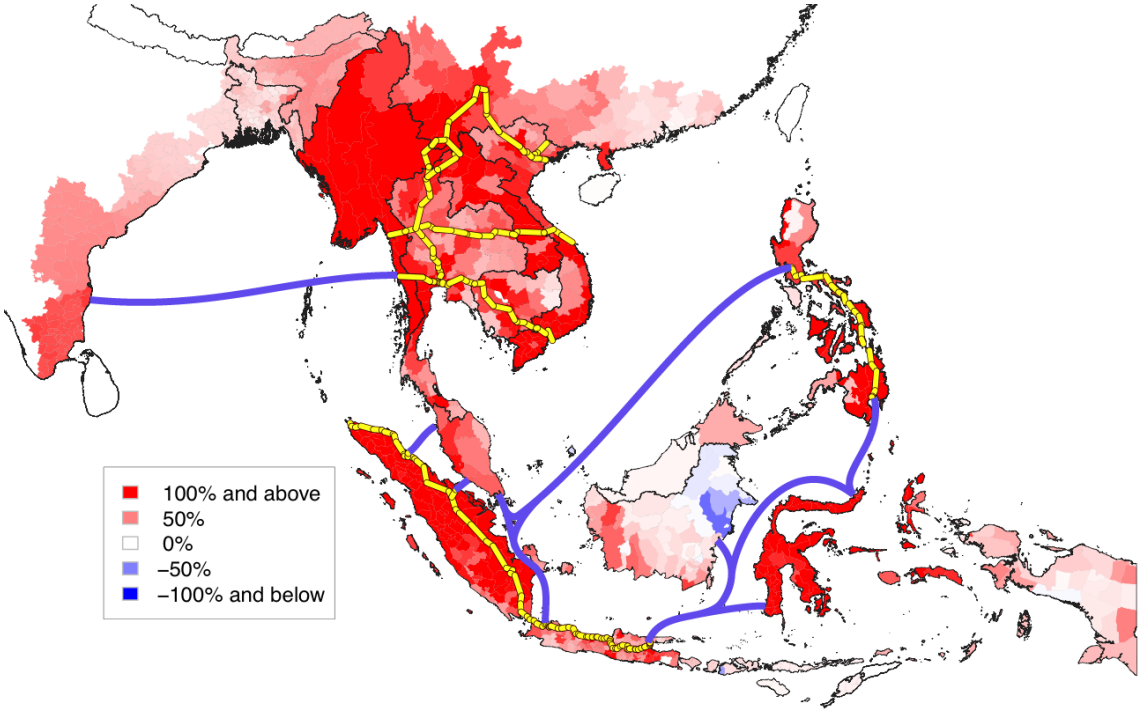


Table 4-2-7. Ranking of economic effects: All corridors

All				
Ranking by Region			Ranking by Country	
Region	Country	Economic Effects	Country	Economic Effects
Kota Lhokseumawe	Indonesia	533.7%	Myanmar	145.8%
Asahan	Indonesia	485.8%	Vietnam	114.6%
Mamuju Utara	Indonesia	480.8%	Laos	99.3%
Kota Pematang Siantar	Indonesia	463.4%	Thailand	98.6%
Rokanhilir	Indonesia	432.8%	Cambodia	97.9%
Indragiri Hilir	Indonesia	419.2%	Indonesia	85.0%
Kota Binjai	Indonesia	411.4%	Philippines	73.4%
Kota Kediri	Indonesia	410.3%	Malaysia	64.4%
Kota Tanjungbalai	Indonesia	408.1%	India	45.6%
Soc Trang	Vietnam	404.4%	Singapore	29.2%
Number of regions with	100% or more	254	China	25.4%
	50% to 100%	239	Bangladesh	23.0%
	0% to 50%	446	Hong Kong	8.2%
	Less than 0%	17	Macao	4.1%
Total Economic Effects in 956 Regions		54.77%	Brunei	2.7%

4-3. Overall assessment

Table 4-3-1 shows a summary of simulation results, focusing on the economic effects in terms of economic growth and the contribution to the narrowing of development gaps.

The second column shows the change in the average annual growth rate for a 10-year period from 2010 to 2020 under each scenario, as compared to that under the baseline scenario. Although all scenarios are expected to lead to higher economic growth, the size of the impacts differs significantly by scenario. Among the three corridors in the Indochina Peninsular, MIEC has the largest impact on growth rates.

An all-corridor scenario leads to the highest economic growth (0.72%). As a result, the sum of regional GDP under this scenario in 2020 is 7.08% more than that under the baseline scenario. At the same time, inequality in the whole region under study, as measured by the Gini coefficient, is reduced by 0.63% as compared to the baseline scenario.

Table 4-3-1. Growth and NDG Impacts of Major Corridors

	Growth Impact		NDG Impact
	Change in Average Annual Growth Rate: 2010-2020	% Difference in RGDP in 2020	% Change in Gini Coefficient
EWEC	0.03 point	0.32%	-0.07%
NSEC	0.01 point	0.14%	-0.13%
MIEC(III)	0.13 point	1.19%	-0.23%
3 Corridors	0.13 point	1.23%	-0.38%
IMT+	0.11 point	1.08%	-0.25%
BIMP+	0.45 point	4.31%	0.08%
All Corridors	**0.72 point**	**7.08%**	**-0.63%**

CHAPTER 5.

FINANCIAL PROJECT DESIGN AND PUBLIC-PRIVATE PARTNERSHIP

The public-private partnership (PPP) is regarded as a key implementation approach for infrastructure development. However, its economic rationale for PPP has not yet been well established, and thus the discussion over PPP is often confused. This chapter discusses the economic logic of PPP in infrastructure development based on public economics theory and presents basic elements and operational structure of PPP in a consistent logical framework. The chapter also provides perspectives for East Asian PPP in our vibrant East Asian economies.

5-1. Investment demand for infrastructure

As the pendulum of development strategies has swung from extreme poverty alleviation to growth orientation with infrastructure development, the required amount of infrastructure investment in growing Asian economies has been the issue. The estimate that used to be often cited was prepared by the joint study of the Asian Development Bank (ADB), Japan Bank for International Cooperation (JBIC), and the World Bank (WB) in 2005; it claimed that investment of US$200 billion for infrastructure would be required annually in the East Asia and Asia-Pacific regions (ADB, JBIC, and WB (2005)).

ADB and ADBI (2009, Chapter 5) present much larger estimates; it argues that US$750 billion per year is required, on average, in Asia and the Pacific regions (including 30 developing countries) amounting to US$8 trillion over 11 years between 2010 and 2020. 68% is new investment while 32% accounts for renewal and maintenance. The sectoral coverage extends to transportation, energy, telecommunication, and water/sanitation.

These estimates are regarded as approximate total amounts. When considering rapid economic growth, particularly in China and India, required investment including depreciation loosely corresponds to 5% or so of annual GDP. Considering that investment ratios are often around 30% or higher, the amount is not particularly surprising. It is a fact that steady infrastructure development is essential to sustained economic growth.

Within the climate of the current global financial crisis, various discussions are

taking place on the necessity of finding a balance between saving and investment (i.e., resource balance) in East Asia, particularly in the context of global imbalance. However, it should be noted that the context differs markedly between China and ASEAN/India. In China, aggressive investment is backed by high savings ratios, which results in sustained, rapid economic growth. However, there is a chronic current account surplus, and it is often argued, whether such claim is warranted or not, that some measures for expanding consumption should be considered if further expansion of investment is difficult. On the other hand, in ASEAN and India, with certain variations across countries, the current account is almost balanced, and thus forced expansion of consumption does not seem to be necessary. Rather, a serious problem exists in the pattern of financial resource flows, which was salient before the Lehman Shock; a large portion of savings in the region goes out of the region for the purchase of relatively riskless assets such as US treasury bonds, and the financial resources come back to the region in the form of investment by US/European investment banks. One issue that East Asia has to take care of is how to develop good projects ourselves and establish financial flows in which our own abundant savings can be used for our own direct investment. This is one of the reasons why large-scale infrastructure development is at issue in East Asia.

5-2. Theoretical foundation of PPP

5-2-1. When is PPP relevant?

The introduction of PPP is often discussed in the context of the shortage of government revenues to finance infrastructure investment. Governments in LDCs may certainly be attracted to the prospect of new infrastructure being financed by the private sector as it will save them money. On the other hand, private players regard PPP as offering new business opportunities with the general expectation that the public sector will, in the end, underwrite the project. Our experience clearly indicates that the implementation of PPP can be problematic unless the roles of public and private participants are clearly stipulated. Stakeholders in PPP are entering into projects with widely differing incentives, thus avoiding moral hazard is extremely important.

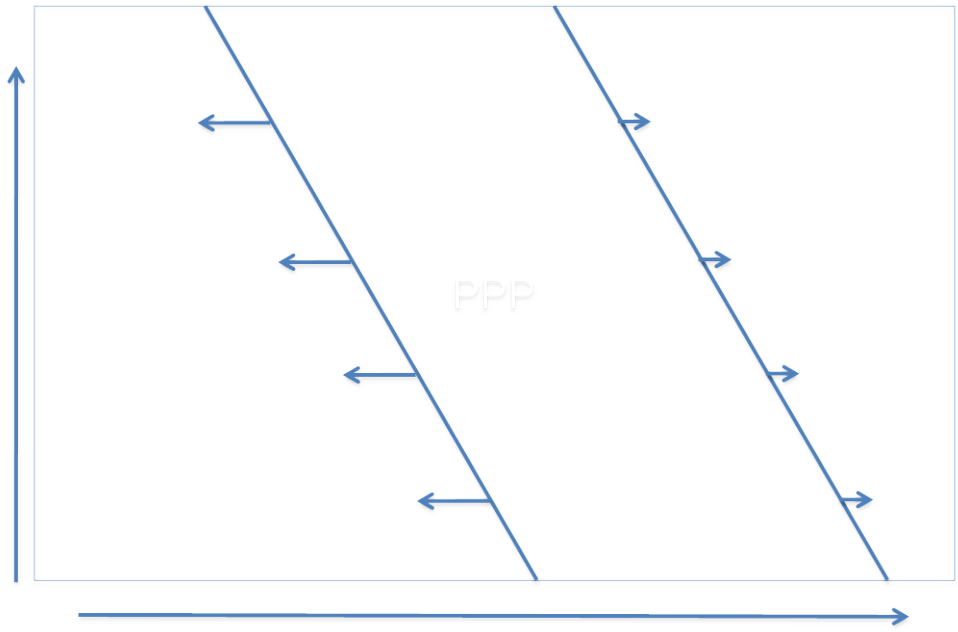
Depending on the context, the definition of PPP is somewhat varied. For our purposes, a rather wide-ranging definition is applied; PPP projects are those in which public sector and private players collaborate in the construction of infrastructure, the procurement of infrastructure and other public services, and/or the financing for these.

Until the early 1980s, it was taken for granted that the construction of

infrastructure and the procurement of infrastructure services would be 100% provided through 100% public. However, in the 1980s, new political thinking on the subject emerged and the privatization of public utility services began. It became clear that the private sector was better-placed to implement certain types of infrastructure projects. Thus, the emergence of a certain type of wholly privately-financed infrastructure was observed; typically, these were economically viable portions of infrastructure procurement which were separated and implemented by the private sector without the public being required to shoulder any of the associated risks.

As the introduction of market mechanism for the procurement of infrastructure and public services proceeds, we gradually realize that a wide range of projects cannot effectively be provided through either 100% public or 100% private. Figure 5-1 depicts three separate types of projects with regard to the involvement of both the public and private sector, and examines the economic viability of the projects and stages of development or the quality of governance. The southwest area of the box includes projects traditionally conducted through 100% public while the northeast area of the box caters for projects with 100% private. Between these two areas, there is an area in which projects cannot be implemented through either 100% public or 100% private. Furthermore, once a PPP scheme is introduced, some parts of 100% public and 100% private may be better handled by PPP; arrows in Figure 5-1 express a possible expansion of the PPP area.

Figure 5-1. Why is public-private partnership needed?



5-2-2. Market failure and the role of government

In order to rigorously specify the role of government in PPP schemes, we should review standard public economics. According to public economics, the role of government may be warranted when market failure exists. The benchmark microeconomic model realizes Pareto efficient equilibria if market distortion does not exist; in such a case, no government intervention is justified. Pareto inferior equilibria imply the existence of market failure. Market failure is typically due to the existence of economies of scale, externalities, public goods, imperfect competition, and incomplete information or uncertainty (Table 5-1). When market failure exists, we may justify a government policy that cancels out market distortion. In such a case, we should apply the first-best policy, whenever possible, that directly counteracts the original distortion without generating new distortion.

Table 5-1. Market failure with which government intervention is possibly justified

Market failure	Examples
Existence of economies of scale	At the firm or plant level At the industry or macro level In industrial agglomeration
Existence of positive or negative externalities	Social net benefits > project net benefits (e.g., infrastructure projects) Social net benefits < project net benefits (e.g., pollution industry)
Existence of public goods	Existence of goods with non-rivalry and non-excludability (e.g., rural access roads)
Existence of imperfect competition	Monopoly, oligopoly State monopoly
Existence of imperfect competition and/or uncertainty	Liquidity constraints (e.g., shortage of SME finance) Super large infrastructure projects

5-2-3. Economic viability of the project

Infrastructure projects are typically accompanied with positive externalities. Even if the procurement of infrastructure generates huge benefits for society as a whole, the project itself may not raise sufficient direct revenue to be economically viable. In such a case, governments may need to provide some form of subsidy to fill the viability gap, taking into consideration the cost and benefit to society as well as the optimal amount of infrastructure procurement. This logic is not necessarily the same as the claim that "whatever the private sector can handle should be implemented by the private sector"; the latter results in the procurement of infrastructure that focuses only on

economic viability and thus is likely to provide a less than optimal amount of infrastructure. It is important to consider costs and benefits for both society as a whole and the project itself in proper project designing.

In addition, even where a project has a high expected financial return, private financing may not be possible because the project is too large for private banks to pool the risk. This is an example of market failure due to liquidity constraints with incomplete information. In such a case, the government may need to provide some kind of insurance.

Markets may fail because of the "public good" characteristics of infrastructure; in such a case, again, government intervention may be justified. It should be noted that "public good" in this context is defined as the opposite of "private good"; non-rivalry and non-excludability characterize public good. A rural access road is a typical example of such a public good. In non-technical writing, the phrase "public good" is often misconstrued as a good provided by the public sector; if we applied such a definition, the argument for justifying PPP would become confusing.

Among various areas of infrastructure, the electricity sector has the most matured business model for PPP. Typically, private players conduct electricity generation while the public sector provides electricity distribution; we have already accumulated a number of successful projects which adhere to this model. Railways, roads, ports, water, and various public services have also started to apply PPP. However, in these sectors, job demarcation between the public and private sectors must still be considered on a case-by-case basis. There remains considerable room for designing a constructive relationship between public and private sectors with creative project packaging.

5-2-4. Additional gains from private incentives

The private sector can bring in additional advantages that the public sector finds hard to achieve. These include, for example, faster realization, innovation, new technology, efficiency in design, construction and operation, reduced lifecycle costs and improved service quality amongst others. There is an expectation that the private sector can run things more efficiently and can obtain better value for money.

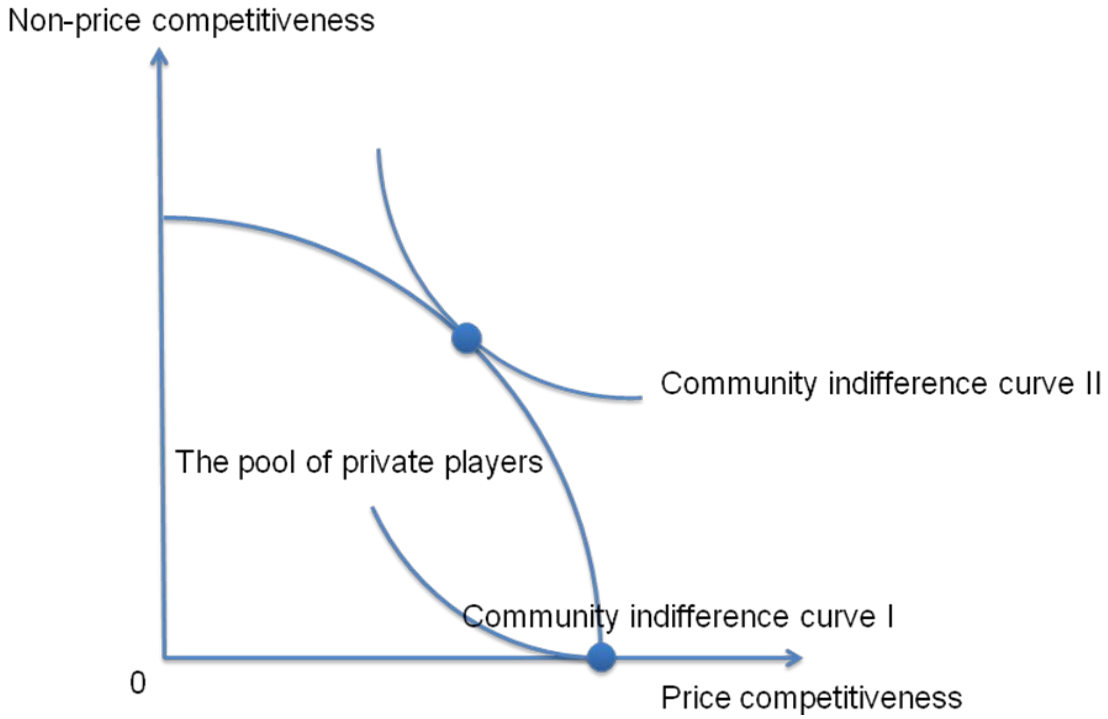
5-2-5. Price and non-price competitiveness of private counterparts

When inviting the private sector to participate, it is essential to introducing healthy competition among private-sector participants. It is thus natural to introduce open bidding and/or other competitive selection processes. It is important not only from an efficiency viewpoint but also to fight against undesirable rent-seeking activities.

At the same time, consideration of the balance between price competitiveness and

non-price competitiveness is crucial. Price competitiveness here refers to the bidding price; a private player offering the lowest price has the highest price competitiveness. On the other hand, non-price competitiveness includes the strengths of private players with respect to safety, reliability, durability of the products, environmental impacts, and others. In open bidding, it is often the case that price competitiveness carries a heavy weight from the viewpoint of saving government expenditure.[1] However, a social optimum exists with appropriate weights between price and non-price competitiveness (Figure 5-2).

Figure 5-2. Price and non-price competitiveness of private players in open bidding



5-3. Toward designing Asian PPP

As PPP is being advocated and implemented all over the world, data and information concerning various cases and experience are accumulated. However, in reality, the approach to PPP needs to be tailored by individual countries because each country has a widely diversified regulatory regime and policy framework at different

[1] A two-envelope method is often applied in open bidding. The first envelope includes a technical proposal to check whether the acceptable level of technical aspects is proposed or not. Then the second envelope with cost estimation is opened to select the cheapest proposal. Such a lexicographic method of selection may be prone to selecting a bidder offering technical aspects at the minimally acceptable level, which is not obviously suboptimal.

stages of development. In addition, globalization delivers an ever-changing and developing environment with new issues and challenges so the PPP concept itself requires constant reviews to update and renew practices and approaches. Hence, the thorough harmonization of regulatory regimes or the establishment of common rules may not be possible or practical. However, some common policy orientation for the best practices can be explored in order to establish a common and shared ground that may help further promote PPP within the region.

The following are the issues that East Asian countries may want to explore further in order to realize successful infrastructure development through PPP.

5-3-1. Prepare key elements for successful PPP

For any economy, a set of key considerations is critical to successful PPP.

(1) Leadership and commitment

PPP requires strong leadership and commitment by the government. PPP can be an effective option for the construction and operation of infrastructure and can also become a strong driver for FDI if it is promoted under proactive leadership.

(2) Policy framework and regulatory environment

Appropriate policy framework should be provided to clarify how the government qualifies PPP projects and supports the private sector. It is also important to establish a sound and stable regulatory environment in order to provide certainty and predictability for investors and financial institutions with respect to rights and obligations of the parties involved, which will establish trust and confidence in the market and promote PPP development in the economy.

(3) A dedicated coordinating section within the central government for promoting PPP

Because of the potential involvement of different layers of public sector entities, effective coordination within the central government may be required for establishing common policy and rules as well as improving practices.

(4) Sharing core philosophy and principles

Core philosophy and principles on the importance of PPP and the course of identifying and evaluating projects and investors must be shared with all stakeholders. To make transactions fair, transparent, and accountable, clear guidelines on the value for money and shared understanding is a must.

5-3-2. Establish robust and transparent regulatory regime

A robust and transparent regulatory regime shall be the basis for creating trust and confidence in the market for PPP to be developed and explored successfully.

(1) Streamlining the existing regulatory regime

While a regulatory regime is already in place in many economies, its inadequacy is often a major impediment for PPP to develop further. Examples include the ambiguity of procedures and the presence of multi-layered government organizations that provide confusing rules and regulations, resulting in additional costs and time delays. Regulatory structure may also need to be constantly up-dated and improved to reflect the market reality and changes in surrounding environment.

(2) Transparency in legal and regulatory regime

Transparency in legal and regulatory regime will ensure certainty and predictability of transactions and reduce risk premium which the private sector may add on and thus minimize overall risks and costs. Establishing and maintaining a transparent and fair process for project identification and tender/contract as well as terms and conditions of support is also crucial to gain trust and confidence from market players. Processes to be taken should be predictable to allow the relevant risks and costs to be assessed by the private sector prior to any action to participate being taken.

5-3-3. Create a framework for funding support and guarantee support

Many economies are systematically launching a system of partial support for funding efforts of the private sector in terms of debt/equity or a specific support by viability gap funding (VGF). Policy options on how to motivate the private sector and how public policy to support the private sector should be optimized though the best practices are yet to be established. Although various policy options do exist, they need to be tested in the market to become practical and effective. Below is a selection of some of the policy options being carried out.

(1) Government finance support (debt/equity)

Long-term debt market is yet to be developed in the region. Therefore, Government's support for private funding efforts may be justified if the scheme is appropriately designed to avoid any moral hazard. The key to effective and successful PPP may be in the designing and structuring of concrete funding and support schemes. Public sector support should be granted with strict justification, in a way so as not to impede efforts by the private entity to carry out its obligations. Consequently, key

principles on public support have to be spelled out as a policy with specific criteria and procedures in order to maintain transparency, fairness, and accountability..

(2) Viability gap funding

VGF, a concept to fill in a viability gap caused by institutional distortion is coming to be acknowledged around the region as an effective tool to enhance project viability and realize PPP delivery. When effectively designed, it should create incentives and yield confidence to market participants in assuming risks and investment. Regulatory structure for such VGF is still under development, but some economies are in the process of instituting such legal framework. Various forms and schemes are available as options to be considered here.

(3) Government guarantee undertaking

This may include various concepts like off-take guarantee of service provided, guaranteeing performance of public sector entities involved including contingent liabilities, guaranteeing specific revenue risks like partial ridership risks, providing a scheme for political guarantee, and others. Such schemes may be essential in the initial years of developing a PPP market.

(4) Cross-border funding support

When the market grows at a high rate with enormous demand for private financing for infrastructure, there exist needs for some cross-border support funding mechanism or funding tools common to the region which any economy may be able to tap into or have access to. Such schemes may be initiated by multi-lateral financing institutions, donors, or both. Private financial market players may also be able to join in such initiatives.

5-3-4. Provide adequate risk mitigation measures for the private sector

Market participants such as investors/financiers are constantly seeking more stable, balanced risk taking ventures in which to invest. Some of the actual issues being witnessed require effective risk-mitigating measures in order to optimize the burden of risk to be borne by the private sector.

(1) Measures to mitigate risks pertaining to land issues

Although regulations to facilitate land purchase or land expropriation are available in most economies, various practical issues relating to land acquisition remain, including whether such regulations should be dealt with by the private sector or whether

it would be better for them to be handled by the public sector. Time delays and cost overruns are typical problems associated with land acquisition. Some mechanisms to mitigate risks such as the creation of a government department that facilitates private sector actions or a contractual land pricing cap may be useful. Creating a fund to support land purchase may be another option. Different issues exist in different economies relating to security, depreciation, and tax treatment that may affect land issues.

(2) One stop shop local permitting/approval system

Complicated permitting/approval system involving multi-layers of central/local governments is a major obstacle that increases costs and causes time delay. Streamlining public sector organization to create a one stop shop permitting/approval system will greatly mitigate risks that the private sector perceives.

5-3-5. Enhance predictability and certainty for financial/contractual practices

Standardization of various documents such as tender documents and model contracts/agreements may help minimize costs and risks to be borne by both public and private sectors and definitively increases predictability and certainty about what can and can not be done, and what could be negotiated.

(1) Standardized documents and model agreements

Effective rules and regulations may not be sufficient to attract the private sector to invest. Investment should be supported by good practices which could be embodied by standardized sector documents and model documents having the effect of creating trust in the market and facilitate various transactions. This may minimize costs and time required for transactions for both the public and private sectors.

(2) Fair and equitable allocation of tasks, obligations, and risks

The allocation of tasks, obligations, and risks should be carried out in a fair and equitable manner, respecting fundamental principles; the party who is most capable of managing and absorbing risks should take such risks. The appetite of market players and the level of risk which the private sector is willing to take shall also have to be taken into consideration.

(3) Sharing knowledge, experience, and know-how on best practices

The best practices in the actual market place (knowledge, experience, and know-how on scheme, structure, and contractual/financial practices) shall better be

shared by market participants, which shall not only increase the quality of practices but also help in reducing the transactional costs. The market environment is constantly evolving as are PPP practices. Sharing knowledge about best practices will contribute considerably to the development of the PPP market. Publication of contracts will also help to create a transparent market place.

5-3-6. Enhanced mechanism for public sector to facilitate PPP process

Projects identified by the public sector often do not move forward due to the shortage of funds available to check the project's feasibility and prepare tender documents. Establishing a project development fund or other kinds of support mechanism may help the public sector realize PPP delivery.

(1) Project Development Funds (PDF) scheme

It is fairly common for the situation to arise in which a project is conceived but there is no progress because line ministries do not have any fund to conduct a detailed feasibility study. To support such studies by dedicated funds (Project Development Funds) may be of great assistance in realizing PPP. Some economies adopt a revolving fund concept in which funds are resourced from the public sector or winning bidders.

(2) Capacity building in the public sector

The public sector must have sufficient capacity and capability to manage the entire process and handle fairly complicated transactions that may differ across sectors and projects. To meet this requirement, the capacity building of the public sector is required to ensure that good governance shall be implemented. Skills development and deployment in the public sector involved in such transactions are also important to realize efficient management of transactions (governance and risk management).

(3) Cooperation with multi-lateral financing agencies and donors

Seeking support and cooperation from multi-lateral financing agencies and/or donor countries may also be quite useful for a given economy to develop a PPP market.

5-3-7. Conduct adequate measures to encourage private participation, secure interest, and gain trust and confidence from market players

PPP becomes a viable option when a sound competitive market and the interest of potential investors willing to undertake the infrastructure projects are created. Efforts to create and maintain such a private sector-friendly environment is a must in order to develop PPP.

(1) Establish sector specific program/policy and publicize project pipelines and timeline

Governments need to address sector issues, elaborate sector policy and sector regulations to clarify the background for developing PPP. It may also be useful to establish project pipelines and timelines so that market participants can understand/assess potentials and opportunities beforehand.

(2) Transparent and fair dispute resolution mechanism

Disputes will necessarily occur between the parties. Regulatory regimes will have to spell out transparent and fair arbitration (including third country arbitration) and litigation process in order to yield trust and confidence to private sector parties.

The difficulty for PPP is in its diversity of concept and its application that needs to be tailored given the specific needs of concrete projects and situations in a given country. PPP is a kind of interaction between a regulatory regime that stipulates and enables partnership among different sectors of the economy and a policy framework that details the intent of the policy makers as well as financial/contractual practices that implement such policies into the rights and obligations of the relevant parties involved.

While complicated, PPP, if implemented successfully, shall become one of the strong drivers for infrastructure development and economic growth as it shall lead to more efficient ways of introducing private funding and financing.

CHAPTER 6.

PROSPECTIVE PROJECTS FOR LOGISTICS AND ECONOMIC INFRASTRUCTURE

The conceptual framework presented in Chapter 3 and the simulation scenarios used in Chapter 4 will be realized through the implementation of a number of specific development projects. This chapter presents an overview of the long list of prospective projects for logistics and economic infrastructure, which was compiled based on the best available information and our tier-wise development strategies. In addition, several prospective projects selected from the long list are presented in relation to the tier-wise development strategies and sub-regional development scenarios.

6-1. Making the CADP strategy implementable

The conceptual framework of the CADP claims that East Asia can pursue the deepening of economic integration and the narrowing of development gaps by reducing services link costs. In the process, the remaining development gaps in the region can be utilized as a source of economic dynamism through relocation or concentration of economic activities. Enhanced connectivity enables low-income regions to invite labor-intensive production processes and to expand existing industries through greater access to large markets. High-income regions, often characterized by industrial agglomerations, can shift to higher value-added economic activities by relocating labor intensive production processes to lower-income regions. The simulation analyses in Chapter 4 confirmed the validity of this conceptual framework, by showing that enhanced connectivity in terms of reduction in money and time costs would accelerate economic growth in wider regions through dispersion and agglomeration forces. Further, it is confirmed that this process can narrow income gaps as measured by Gini coefficients.

Development of physical infrastructure is one of the necessary conditions to realize this scenario. Infrastructure projects are usually formulated by national governments, donor countries agencies including international development banks, and private companies. The list of projects presented below is a compilation of prospective projects for logistics and economic infrastructure, based on publicly available information. In addition, we classified prospective infrastructure projects in terms of sub-regions (Mekong, BIMP+, and IMT+), three tiers, and priority in accordance with

the conceptual framework of the CADP. Tables 6-1 and 6-2 summarize the number of prospective projects identified in the CADP and cost estimates respectively.

Table 6-1. Summary table: Prospective projects identified in the CADP

	Total	Mekong	BIMP+	IMT+	Brunei Darussalam	Cambodia	Indonesia	Laos	Malaysia	Myanmar	Philippines	Singapore	Thailand	Vietnam	China	India
Total	**695**	**452**	**190**	**61**	**2**	**103**	**169**	**77**	**23**	**26**	**52**	**0**	**60**	**188**	**11**	**33**
Priority																
Top Priority	**170**	113	51	14	1	15	33	1	3	8	25	0	26	57	1	18
Priority	**166**	87	56	23	0	19	53	6	7	6	17	0	7	48	1	10
Normal	**359**	252	83	24	1	69	83	70	13	12	10	0	27	83	9	5
Tier																
Tier 1	**178**	109	63	6	0	0	45	0	7	0	18	0	22	65	1	20
Tier 2	**313**	217	59	45	1	58	60	26	10	22	27	0	34	110	4	7
Tier 3	**204**	126	68	10	1	45	64	51	6	4	7	0	4	13	6	6
Type																
Public	**541**	358	146	45	2	95	121	71	21	25	45	0	54	125	11	17
PPP	**154**	94	44	16	0	8	48	6	2	1	7	0	6	63	0	16
Sector																
Logistics	**443**	279	128	44	2	60	106	55	13	18	46	0	39	100	8	18
: Road / Bridge	*227*	150	66	11	1	37	54	43	2	6	21	0	10	49	5	7
: Railway	*66*	51	6	9	0	6	9	3	5	2	0	0	19	19	0	4
: Port / Maritime	*99*	44	41	22	1	8	34	1	5	9	18	0	7	23	0	6
: Airport	*36*	28	6	2	0	6	4	7	1	1	3	0	2	8	3	1
Other Economic	**201**	146	45	10	0	32	45	22	7	8	3	0	21	78	3	9
: Industrial Estate / SEZ	*56*	56	0	0	0	8	0	7	0	3	0	0	8	28	0	4
: Energy / Power	*135*	80	45	10	0	17	45	13	7	3	3	0	11	47	2	5
: Telecommunication	*12*	11	1	0	0	8	1	2	0	2	0	0	2	3	1	0
Urban and Social	**49**	25	17	7	0	11	18	0	3	0	3	0	0	10	0	4
Others (Soft)	**2**	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2

Table 6-2. Summary table: Cost estimates

	Mekong				BIMP+				IMT+				ALL Sub-regions			
		Public	PPP	Sub-total		Public	PPP	Sub-total		Public	PPP	Sub-total		Public	PPP	Sub-total
Tier 1	Top Priority	139,205	36,721	175,926	Top Priority	41,088	15,206	56,294	Top Priority	272	0	272	Top Priority	180,565	51,927	232,492
	Priority	28,817	3,134	31,951	Priority	9,047	2,873	11,921	Priority	665	275	939	Priority	38,530	6,282	44,811
	Normal	271	0	271	Normal	1,148	2,075	3,223	Normal	279	0	279	Normal	1,698	2,075	3,773
	Sub-total	168,293	39,855	208,148	Sub-total	51,284	20,154	71,438	Sub-total	1,216	275	1,490	Sub-total	220,793	60,283	281,076
		Public	PPP	Sub-total		Public	PPP	Sub-total		Public	PPP	Sub-total		Public	PPP	Sub-total
Tier 2	Top Priority	4,076	3,456	7,532	Top Priority	4,415	1,006	5,420	Top Priority	326	2,749	3,075	Top Priority	8,817	7,210	16,027
	Priority	6,154	3,553	9,707	Priority	5,557	690	6,247	Priority	1,501	818	2,319	Priority	13,211	5,061	18,272
	Normal	31,716	4,348	36,065	Normal	1,602	2,301	3,903	Normal	3,642	275	3,917	Normal	36,960	6,925	43,885
	Sub-total	41,946	11,357	53,303	Sub-total	11,573	3,997	15,570	Sub-total	5,469	3,842	9,311	Sub-total	58,988	19,196	78,184
		Public	PPP	Sub-total		Public	PPP	Sub-total		Public	PPP	Sub-total		Public	PPP	Sub-total
Tier 3	Top Priority	0	0	0	Top Priority	0	0	0	Top Priority	0	0	0	Top Priority	0	0	0
	Priority	22	1,190	1,212	Priority	25	24	49	Priority	12	15	27	Priority	59	1,229	1,288
	Normal	15,277	1,683	16,960	Normal	8,929	2,469	11,398	Normal	821	0	821	Normal	25,028	4,152	29,180
	Sub-total	15,299	2,873	18,172	Sub-total	8,954	2,493	11,447	Sub-total	833	15	848	Sub-total	25,087	5,381	30,468
		Public	PPP	Sub-total		Public	PPP	Sub-total		Public	PPP	Sub-total		Public	PPP	Sub-total
ALL Tiers	Top Priority	143,281	40,176	183,457	Top Priority	45,503	16,212	61,715	Top Priority	598	2,749	3,347	Top Priority	189,381	59,137	248,519
	Priority	34,992	7,877	42,870	Priority	14,629	3,587	18,216	Priority	2,178	1,108	3,285	Priority	51,799	12,572	64,371
	Normal	47,265	6,031	53,296	Normal	11,680	6,845	18,524	Normal	4,742	275	5,018	Normal	63,687	13,151	76,838
	Sub-total	225,538	54,085	279,623	Sub-total	71,811	26,644	98,456	Sub-total	7,518	4,132	11,650	Grand-total	304,867	84,861	389,728

Another necessary condition for the CADP scenario is improvement in soft infrastructure. Liberalization and facilitation of trade in goods and services, as well as investment, are the typical elements. In the field of trade facilitation, the timely establishment of the ASEAN Single Window (ASW) should be regarded as one of the top priority initiatives. Moreover, transport facilitation measures such as the Cross Border Transport Agreement (CBTA) under the GMS initiative and transport facilitation agreements in ASEAN[1] are expected to reduce significantly the time and money costs of international trade in goods, as well as some services such as tourism. In order to enhance regional connectivity through reliable and economically viable shipping routes, various institutional arrangements would be necessary in addition to the development and improvement of physical infrastructure such as ports and related facilities. ASEAN's initiatives for an ASEAN Single Aviation Market (ASAM) and Air Transport Agreements with its dialogue partners are also expected to contribute to enhancing regional connectivity. Last but not least, the importance of capacity-building programs should not be underestimated.

In the rest of this chapter, section 6-2 links selected prospective projects with tier-wise development strategies discussed in Chapter 3, and section 6-3 provides additional discussion on the basic strategy for three sub-regions in relation to selected prospective projects. The full version of the long list of prospective projects, classified by three sub-regions (Mekong, IMT+, and BIMP+), three tiers, and priority, appears as Appendix 1.

[1] ASEAN Framework Agreement on the Facilitation of Goods in Transit (AFAFGIT), ASEAN Framework Agreement on the Facilitation of Inter-state Transport (AFAFIST), and ASEAN Framework Agreement on Multi-modal Transport (AFAMT). ASEAN has been accelerating the implementation of these agreements to support the establishment of the ASEAN Economic Community by 2015.

6-2. Prospective projects and the tier-wise development strategies

As discussed in detail in Chapter 3, the CADP proposes three tiers of development strategies, and the necessary logistic and economic infrastructure differs by tier. Tables 6-3 to 5 link selected prospective projects from the long list with the tier-wise development strategies.

Table 6-3. Prospective projects for tier-wise development strategies: Tier 1

Key infrastructure	Project name	Country
Logistics infrastructure		
1. Roads / bridges		
► Highway system, bridges and bypass roads in and around metropolitan areas	► Western Guangxi Road development	China
	► Expressway: Chennai − Bangalore	India
	► Outer ring road in Chennai: Phase II	India
	► Bangalore − Mysore Infrastructure Corridor (BMIC) and peripheral ring road (Phase I) in Bangalore	India
	► Highway management project: additional financing	Thailand
	► Expressway: Ha Noi- Lao Cai, phase I	Vietnam
	► Expressway: Noi Bai- Ha Long − Mong Cai	Vietnam
	► Expressway: Ben Luc − Long Thanh	Vietnam
	► Expressway: Gie − Ninh Binh, phase 1	Vietnam
	► Expressway: Bac Ninh − Lang Son	Vietnam
	► Expressway: Ho Chi Minh City − Thu Dau Mot	Vietnam
	► Expressway: Thrung Luong − My Tuan	Vietnam
	► Ha Noi − Lang Son Corridor: National road No.1	Vietnam
	► Bypass around Ho Chi Minh City	Vietnam
	► Ho Chi Minh City ring road No.3	Vietnam
	► Dinh Vu bridge	Vietnam
	► Vinh Thinh bridge	Vietnam
	► Intelligent Traffic System in Jabotabek	Indonesia
	► Improvement of transport information system in Jakarta	Indonesia
	► Central Ruzon highway and Japan Philippines Friendship Road	Philippines
	► Arterial highway bypass construction project	Philippines
	► Cavite − Laguna east−west narional road	Philippines
	► Cavite − Laguna north south highway	Philippines
	► Metro Manila C6 expressway	Philippines
	► Improvement of existi9ng bridges along Pasig River and Marikina River	Philippines
► Access roads/bridges to gateway ports/airports	► Chennai port − Ennore port accessway construction	India
	► Expressway: Bien Hoa − Vung Tau	Vietnam
	► Road construction to connect Noi Bai international airport and Nhat Tan bridge	Vietnam

	► NAIA expressway and MIAA's international cargo terminal	Philippines
2. Railways		
► Urban public transport system (subway, LRT, MRT) and railways to connect urban and suburban areas	► Bangalore METRO: Phase II	India
	► Bangkok MRT: various lines	Thailand
	► Jakarta MRT: various lines	Indonesia
	► Surabaya MRT	Indonesia
	► Manila LRT 1st line south extention	Philippines
	► Manila LRT 2nd line extention	Philippines
	► Urban railway: Hanoi- Lang Hoa Lac	Vietnam
	► Railway: Trang Bom − Hoa Hung	Vietnam
	► Railway: Ho Chi Minh City − My Tho	Vietnam
	► North − South high speed railway	Vietnam
► Access railways to gateway ports/airports	► Urban railway: Hanoi- Noi Bai international airport	Vietnam
	► Railway: Hanoi − Haiphong, phase 1	Vietnam
	► Railway: Ho Chi Minh City to Vung Tau (Cai Mep − Thi Vai port)	Vietnam
	► Railway to connect Soekarno Hatta airport and Manggarai	Indonesia
3. Ports / maritime		
► Sizable port facility to cater massive container transactions and specialized loading facilities	► Ennore port container terminal: phase 1	India
	► Laem Chabang port: phase 2, construction of container terminals C and D	Thailand
	► Penang port: expansion of container terminals	Malaysia
	► Transshipment port in Vung Tau − Ba Ria province	Vietnam
	► Petroleum gas service port development in Sao Mai − Ben Dinh	Vietnam
	► Lach Huyen port development	Vietnam
	► Cai Mep − Thi Vai port: operation and maintenance	Vietnam
	► Cai Mep − Thi Vai port: upgrading the channels	Vietnam
	► Cai Lan port: additional installation of quay clanes	Vietnam
	► Jakarta 2nd port	Indonesia
	► Greater Surabaya metropolitan port	Indonesia
	► Tanjung Perak port: new terminal and access road	Indonesia
	► World class Subic international seaport	Philippines
	► Manila port: expansion of container terminal	Philippines
	► Cebu port: development of new port	Philippines
4. Airports		
► Sizable airport facility to cater massive movements of passengers and freight	► Sriperumbudur international airport (Chennai)	India
	► Suvarnabhumi airport: phase 2	Thailand
	► Long Thanh international airport development (HCMC)	Vietnam
	► Cat Bi airport improvement (Hai Phong)	Vietnam
	► Terminal 2 construction of Noi Bai international airport (Hanoi)	Vietnam
	► Upgrading of Clark international airport	Philippines

	► KLIA capacity enhancement	Malaysia
Other economic infrastructure		
1. Industrial estates / special economic zones		
► High-tech park with private initiatives	► Ennore Industrial Park and SEZ	India
	► Sri City (integrated business city)	India
	► IT and ITES park in Pathum Thani comprehensive development zone (CDZ)	Thailand
	► Pharma and biotech city in Ayutaya	Thailand
	► Hoa Lac high tech park	Vietnam
	► Software technology park in Ho Chi Minh City	Vietnam
	► Petrochemical complex in Ba Ria − Vung Tau	Vietnam
	► Vietnam space center project	Vietnam
2. Energy / power		
► Stable and ample supply of electricity and energy for both industries and residences	► Nuclear power plant	Thailand
	► Can Tho − Ho Chi Minh City transmission line	Vietnam
	► Nhon Trach thermal power plant IPP project	Vietnam
	► Thin Ninh Thuan nuclear power plant	Vietnam
	► Song Hau coal fired power plant	Vietnam
	► Ho Chi Minh City ultra high voltage transmission line	Vietnam
	► Bakun submarine transmission cable	Malaysia
	► Upper Cisokan pumped strage power plant	Indonesia
	► Central Java coal fired steam power plant: up to 2000MW	Indonesia
	► Java − Bali submarine cable, 150kV, circuits 3&4	Indonesia
	► Muara Tawar add on block 2, 3, 4 combined cycle power plant: 825−1200 MW	Indonesia
	► Rehabilitation and modernazation of Paiton small power producer 1&2: 2x400MW	Indonesia
	► Nuclear power plant	Indonesia
	► Indramayu coal fired power plant	Indonesia
3. Telecommunication		
► Infrastructure services for innovative society	► Enhancement of ICT infrastructure in Hanoi	Vietnam
Urban and social infrastructure		
1. Water and sanitation, medical, and others		
► Metropolitan and social infrastructure for urban amenity	► GROPA W3: expanding piped water supply to urban poor in Surabaya	Indonesia
	► Water supply/sanitation: DKI Jakarta − Bekasi − Karawang	Indonesia
	► Water supply/sanitation: West Cikarang − Cibitung	Indonesia

Table 6-4. Prospective projects for tier-wise development strategies: Tier 2

Key infrastructure	Project name	Country
Logistics infrastructure		
1. Roads / bridges		
► Middle-distance roads for connecting industrial centers, logistics hubs, and neighboring industrial agglomerations	► Upgrading of road link between Phnom Penh to Sihanoukeville ports from 2 to 4 lanes	Cambodia
	► Reconstruction of national road No.3 from Phnom Penh to Kampot	Cambodia
	► Mekong Bridge in Neak Loung	Cambodia
	► Mekong Bridge in Takmov (Phnom Penh)	Cambodia
	► Cross border facilities at Moc Bai − Bavet	Cambodia, Vietnam
	► Development of road links from Dawei port to Bong Tee (Thailand border) and road from Bong Tee to Kanchanaburi in Thailand as 4−lane access controlled expressways	Myanmar, Thailand
	► Toll road: Medan− Binjai	Indinesia
	► Toll road: Medan− Kualanamu − Tebing Tinggi	Indinesia
	► Toll road: Pekanbaru− Kandis − Dumai	Indinesia
► Sub-urban road system for avoiding congestion	► Bypass around Phnom Penh city	Cambodia
	► Semplak bypass	Indonesia
	► Musi bridge III construction: Phase I	Indonesia
	► Construction of ring roads and bypasses in Georgetown, Pulau Pinang; Seremban, Negeri Sembilan; and Johor Bahru, Johor	Malaysia
	► Bypass: Palo	Philippines
	► Bypass: General Santos City	Philippines
	► Bypass: Korondal City	Philippines
	► Bypass: Tuguegarao City	Philippines
2. Railways		
► Development of regional arterial railway networks	► SKRL missing link: Bat Dang (Phnom Penh)- Loc Ninh section (255km)	Cambodia
	► SKRL missing link: Poipet- Sisophon (48km)	Cambodia
	► SKRL missing link: Loc Ninh to Ho Chi Minh City (129km)	Vietnam
3. Ports / maritime		
► Upgrading major ports to enhance handling capacity	► Rehabilitation of Phnom Penh port: container terminal	Cambodia
	► Expansion of Sihanoukeville port: extension of container terminal berth, additional installation of quay clanes	Cambodia
	► New Dawei deepwater port	Myanmar
	► Thilawa port: Terminal development and enhancement of management	Myanmar
	► Yangon port: Installation of quay cranes	Myanmar
	► The coastal channels and ports development	Thailand
	► Construction of international container port in Van Phong, Khanh Hoa Province	Vietnam
	► Lien Chieu port development	Vietnam

	► Ky Ha port (Chu Lai) development	Vietnam
	► Da Nang port improvement project, phase II	Vietnam
	► Muara port: Development of container terminal	Brunei
	► Tanjung Emas port: Development of deep water terminal	Indinesia
	► Makassar port: Development of container terminal	Indonesia
	► Dumai port development	Indonesia
	► Belawan port (Medan) Expansion	Indonesia
	► Greenfield development of Naklua port	Thailand
	► Phuket port improvement.	Thailand
	► Construction of new cargo port at Pakbara	Thailand
4. Airports		
► Upgrading major airports for both passengers and cargos	► Upgrading of Sihanoukeville airport	Cambodia
	► New Medan airport construction project	Indonesia
	► Savannakhet airport improvement: Phase I	Laos
	► Da Nang international airport: Construction of passenger terminal	Vietnam
	► Upgrading of Na San airport in Dien Bien Phu	Vietnam
Other economic infrastructure		
1. Industrial estates / special economic zones		
► SEZs in border areas and population centers	► Industrial estate in Koh Kong	Cambodia
	► Industrial estate in Poipet	Cambodia
	► Industrial estate in Ban Laem − Kamrieng or in Ban Pakkad−Pailin (Thai border)	Cambodia
	► Industrial zone in Sihanoukville	Cambodia
	► SEZ development in border area (Savannakhet Province)	Laos
	► SEZ/FTZ and international trade exchange center in Dawei	Myanmar
	► Moc Bai cross−border economic zone	Vietnam
	► Ca Mau industrial park	Vietnam
2. Energy / power		
► Stable and ample supply of electricity and energy for industries	► Transmission line between Kampot and Sihanoukville: 230kV, double circuits	Cambodia
	► Stung Meteuk 1 hydro power plant	Cambodia, Thailand
	► Gas pipeline: Atuthaya − Sakeo − Poipet	Cambodia, Thailand
	► Gas pipeline: Maptaphut − Chantaburi − Koh Kong	Cambodia, Thailand
	► Vietnam − PRC power interconnection project preparatory technical assistance and construction: GMS power interconnection phase 2	Vietnam, China
	► O Mon 2 combined cycle power plant as joint venture IPP	Vietnam
	► O Mon thermal power plant and Mekong delta transmission network project	Vietnam
	► Nghi Son thermal power plant construction project, phase II	Vietnam
	► Sarulla geothermal power plant	Indonesia

3. Telecommunication		
► Development/upgrading of trunk telecommunication network	► Fibre optic cable between Phnom Penh and Sihanoukville	Cambodia
	► Internet telephony infrastructure in Thailand and neighboring couutries	Thailand, Myanmar, Laos, Cambodia
Urban and social infrastructure		
1. Water and sanitation, medical, and others		
► Improving water and sanitary conditions in urban areas	► Water supply/sanitation in Bandung Municipality (Cimenteng)	Indinesia
	► Water supply/sanitation in Indramayu regency	Indonesia
	► Water supply/sanitation in Cirebon	Indonesia
	► Integrated solid waste final disposal and treatment facility for Bogor and Depok Area – West Java (Nmbo)	Indonesia
	► Water supply/sanitation in Medan municipality	Indonesia
	► Water supply/sanitation in Bandar Lampung municipality	Indonesia

Table 6-5. Prospective projects for tier-wise development strategies: Tier 3

Key infrastructure	Project name	Country
Logistics infrastructure		
1. Roads / bridges		
► Long-distance road connection and rural road networks for various industrial development	► Highway: Kanchanaburi - Dawei	Thailand / Myanmar
	► Ennnore Manali Road and NCTPS Road Imporvement	India
	► Northern Port Access Road	India
	► Upgradation and maintainance of Trans Slawesi road	Indonesia
	► Rehabilitation NR57: Batambang - Paylin - Thai border	Cambodia
	► Rehabilitation of national road No.64: Kg.Thom-Prehvihear	Cambodia
	► Rehabilitation of bridges along national road No.64	Cambodia
	► Improvement of roads in the southern region	Laos
2. Railways		
► Middle-distance railways for resource-based industries	► Railway for aluminum mining and manufacturing in the west plateau	Vietnam
	► Coal railway connecting Palaci and Bangkuang (coal mine to river port)	Indonesia
3. Ports / maritime		
► Upgrading of local ports	► Kemaman Port: Development of Multi Purpose Terminal	Malaysia
	► Bintulu Port: Expansion of Container Terminal	Malaysia
	► Sandakan Port: Development of Berthing facilities for berges	Malaysia
	► Kyaulphu Port: Upgrading the Jetty	Myanmar
	► Mawlamyine Port: Making the Plan for Port Development	Myanmar
	► Expansion of Vung Ang Port	Vietnam
	► Tanah Ampo cruise terminal, Karangasem (Bali)	Indonesia
	► Pontianak port: Dredging channel, renewal of quay cranes, expansion of terminal	Indonesia
	► Balikpapan port: Development of new container terminal	Indonesia
	► Bitung port: Expansion of terminal	Indonesia
	► Jayapura port: Extension of mult-purpose terminal	Indonesia
	► Sorong port: Expansion of container terminal	Indonesia
	► Banjarmasin port: Development of a master plan on utilization in port area	Indonesia
	► Kuala Enok port (South of Dumai) improvement	Indonesia
	► Ulee Lheue port (Banda Aceh) improvement	Indonesia
	► Mafahayati port (Banda Ache) improvement	Indonesia
	► Palembang port: Dredging channel	Indonesia
	► Panjang port: Developnment of general cargo teminal	Indonesia
	► Iloilo port: Installation of quay cranes	Philippines
	► Cagayan de Oro port: Development of ramp for RORO ships	Philippines

	► Davao port: Development of quay crane and expansion of container terminal	Philippines
	► General Santos port: Installation of quay cranes	Philippines
	► Zamboanga port: Development of international passenger terminal	Philippines
	► Songhkla Port: Dredging Channel and Installation of Quay Crane	Thailand
4. Airports		
► Upgrading/development of local airports	► Mondolkiri airport development	Cambodia
	► Preah Vihea airport improvement	Cambodia
	► Stung Treng airport improvement	Cambodia
	► Kraches airport improvement	Cambodia
	► Ratanakiri airport improvement	Cambodia
	► Wattay international airport improvement	Laos
	► Upgrading of Pakse, Savannakhet and Luang Prabang airports	Laos
	► Construction of Luang Namtha airport	Laos
	► Upgrading of Dawei airport	Myanmar
	► International Airport Development: Chu Lai	Vietnam
	► International Airport Improvement: Cam Ranh	Vietnam
	► Construction of Duong To international airport, Phu Quoc	Vietnam
	► Van Don international airport improvement	Vietnam
Other economic infrastructure		
1. Industrial estates / special economic zones		
► Industrial estates in growth nodes	► Agro−forestry SEZ in Thakek	Laos
	► Luang Namtha Development Industrial Zone (200 ha)	Laos
	► Economic and service centres in Luang Prabang	Laos
2. Energy / power		
► Development of power plants taking advantage of location advantages	► Xe Katam hydroelectric power project for the export of electricity to Thailand	Laos
	► Nam Ngum 1 hydropower station expansion	Laos
	► Hoa Binh hydropower plant extension project	Vietnam
	► Lahendong geothermal project	Indonesia
	► Sembalun GEOPP, Lombok (2x10 MW)	Indonesia
	► Marea hydropower plant construction project	Indonesia
	► Bonto Batu hydropower plant construction project	Indonesia
► Local supply of electricity and energy	► Rural electrification along national road No.9	Laos
	► Rural energy II: Additional financing	Vietnam
3. Telecommunication		
► Local telecommunication networks	*No relevant project*	
Urban and social infrastructure		
1. Water and sanitation, medical, and others		
► Improving water and sanitary conditions	► Provincial capital water supply improvement project: Phase II	Cambodia

	► Rehabilitation of Siem Reap stream	Cambodia
	► Improvement of water supply systems of Maros and Takalar	Indonesia
	► Construction of dams (Raknamo, Temef) for water resources development in NTT Province	Indonesia
	► Water supply to Sabah, Sarawak, Pahang, Kelantan, Terengganu and Kedah states	Malaysia
	► Flood mitigation Works for Kota Bharu and other selected areas along Sungai Kelantan in Kelantan	Malaysia
	► Tami Nadu water supply project	India
	► Karnataka water supply and sanitation Projects	India

6-3. Selected prospective projects and sub-regional development scenarios

This subsection provides brief explanation on how to apply the conceptual framework of the CADP to the tier-wise development strategies from sub-regional points of view, by highlighting selected prospective projects in the long list presented in the last sub-section.

6-3-1. Mekong sub-region

The Mekong sub-region in the CADP has a slightly wider scope than the Greater Mekong Subregion (GMS) under the ADB initiative, in the sense that we also highlight the connectivity between ASEAN and India, as discussed in the simulation scenario of the Mekong India Economic Corridor (MIEC)[2].

The Mekong sub-region consists of vibrant industrial agglomerations such as Bangkok, Hanoi, Ho Chi Minh, and Chennai (Tier 1), cities with high potential to join international production networks in the region such as Phnom Penh, Vientiane, Yangon, Danang, Kunming, and many cities in Thailand (Tier 2), and regions which may take a certain time period to participate in the production networks such as the mountainous areas in Cambodia, Laos and Myanmar (Tier 3). A distinctive feature of the Mekong sub-region is the huge diversity in the levels of economic development, as indicated by differences in income levels (Figure 2-13). As discussed in Chapter 1, the wage differentials and differences in location advantages can be a main driving force of fragmentation, through which international production networks expand the frontiers. In order to pursue deepening economic integration and narrowing development gaps, a number of policy measures, including infrastructure development, should be designed in an integrated manner to enhance the location advantages of each region.

As illustrated in Figure 6-1, existing industrial agglomerations (Tier 1) will require that infrastructure projects in particular make themselves more innovative. Improvement in urban transportation is one of the most important elements for this purpose. In Bangkok, for example, the Mass Rapid Transport (MRT) network should be expanded to accommodate more economic activities while mitigating negative congestion effects. The bypass around Ho Chi Minh and rail links from Hanoi to neighboring cities including the Noi Bai International Airport need to be developed or enhanced to meet rapidly growing demand. In addition, special purpose industrial zones, such as the Hoa Lac High Tech Park and a software technology park, are proposed in order to facilitate innovative activities.

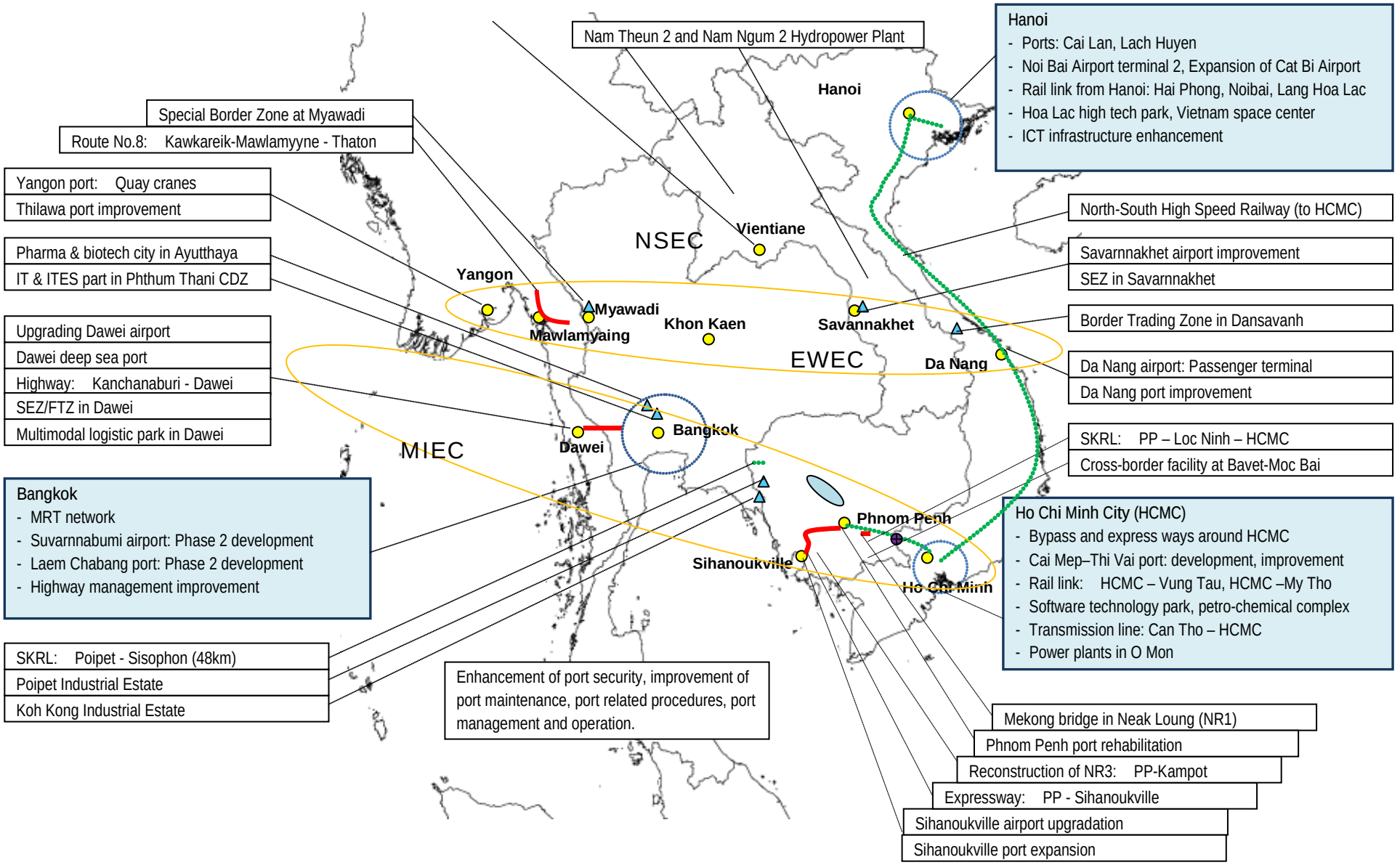
[2] Refer to subsection 4-2-2-(3).

For the development of Tier 2, elimination of the remaining missing or weak links in the regional transport networks is of crucial importance. For example, as illustrated in Figure 4-2-3a, the construction of a Mekong bridge in NeakLoung, Cambodia, is expected to have a strong impact on the Mekong region, by facilitating fragmentation of some parts of production activities from the neighboring industrial agglomerations and other regions. The biggest missing link in the Mekong India Economic Corridor (MIEC) resides between Kanchanaburi and Dawei. By developing a highway and deep seaport in Dawei, economies in the Indochina Peninsula will have a short-cut to the Andaman Sea. The expected impact on the Mekong sub-region becomes much larger than without, as indicated in Figure 4-2-3b. Da Nang, being the terminal city of the East West Economic Corridor (EWEC), is expected to improve its port and airport facilities, as this would enhance the attractiveness of all regions along the corridor.

The development of Dawei can be regarded as an example of Tier 3 development strategy. In addition to the highway connection with Thailand and the deep sea port, it is recommended to develop a special economic zone (SEZ), free trade zone (FTZ), and a multimodal logistic park in Dawei. By doing this, Dawei can enhance its location advantages, that is, lower labor costs, proximity to Bangkok, and the favorable geographical position as a gateway port to the Andaman Sea. Another example of Tier 3 strategy is the development of industrial estates in border areas, such as Poipet, Koh Kong, Savarnakhet, and Dansavanah, where wage differentials can be relatively easily utilized.

In addition to physical infrastructure, institutional connectivity should be enhanced through various trade and transport facilitation measures, such as the ASEAN Single Window (ASW), the Cross Border Transport Agreement (CBTA), and ASEAN's framework agreements on transport facilitation, as these are expected to reduce the cost of border crossing, in terms of both money and time.

Figure 6-1. Selected Prospective Projects in Mekong Sub-region



6-3-2. IMT+ sub-region

The IMT+ sub-region in the CADP is an extended concept of the Indonesia, Malaysia, and Thailand Growth Triangle (IMT-GT), in the sense that IMT+ pays explicit attention to the connectivity with neighboring industrial agglomerations, i.e., Bangkok and Jakarta. This reflects our view on the important roles of existing industrial agglomerations (Tier 1) as a large market as well as a potential source of economic activities to be located in, or relocated to, the main part of the IMT+ through fragmentation. In the center of the IMT+ sub-region, there are two industrial agglomerations on the west side of the Malay Peninsula, spanning from Kuala Lumpur to Penang, and Singapore and surrounding regions[3]. Although the other part of the IMT+ region has not yet been industrialized, several cities in Sumatera Island, such as Medan, Pekanbaru/Dumai, and Palembang, can be regarded as Tier 2 because of their potential for taking advantage of lower labor costs, large population, and the proximity to existing industrial agglomerations. The remaining part of IMT+ can be regarded as Tier 3, characterized by resource-based economic activities such as agriculture and agro-basedindustry, mining, and tourism.

Industrial agglomerations in Malaysia and Singapore are already well developed in terms of infrastructure, and are connected by high quality toll roads and highways. Although the expansion of the Kuala Lumpur International Airport (KLIA) and the Light Rail Transport (LRT) system is proposed, the development strategy for these two industrial agglomerations should focus more on policy measures to support innovative activities, as discussed in section 3-2.

From a region-wide perspective, the development strategy for the IMT+ sub-region should focus on how the large potential of Sumatera Island can be exploited. For this purpose, the connectivity between Sumatera Island and the Malay Peninsula needs to be enhanced by establishing efficient and reliable shipping routes. Considering the short distance and presumably low traffic volume, at least at the initial stage, it is recommended that the shipping routes are established by RO-RO (Roll on – Roll off) vessels. Potential routes could be Belawan (Medan) – Penang and Dumai – Malacca. In order to accommodate RO-RO vessels and more traffic volume, it is necessary to improve the ports of Belawan and Dumai, as well as access roads to the ports.

Another strategy is to drastically upgrade the Trans-Sumatera Highway, which connects major cities in North and South Sumatera, as envisaged in the Indonesia Economic Development Corridor (IEDC). Several toll road construction projects

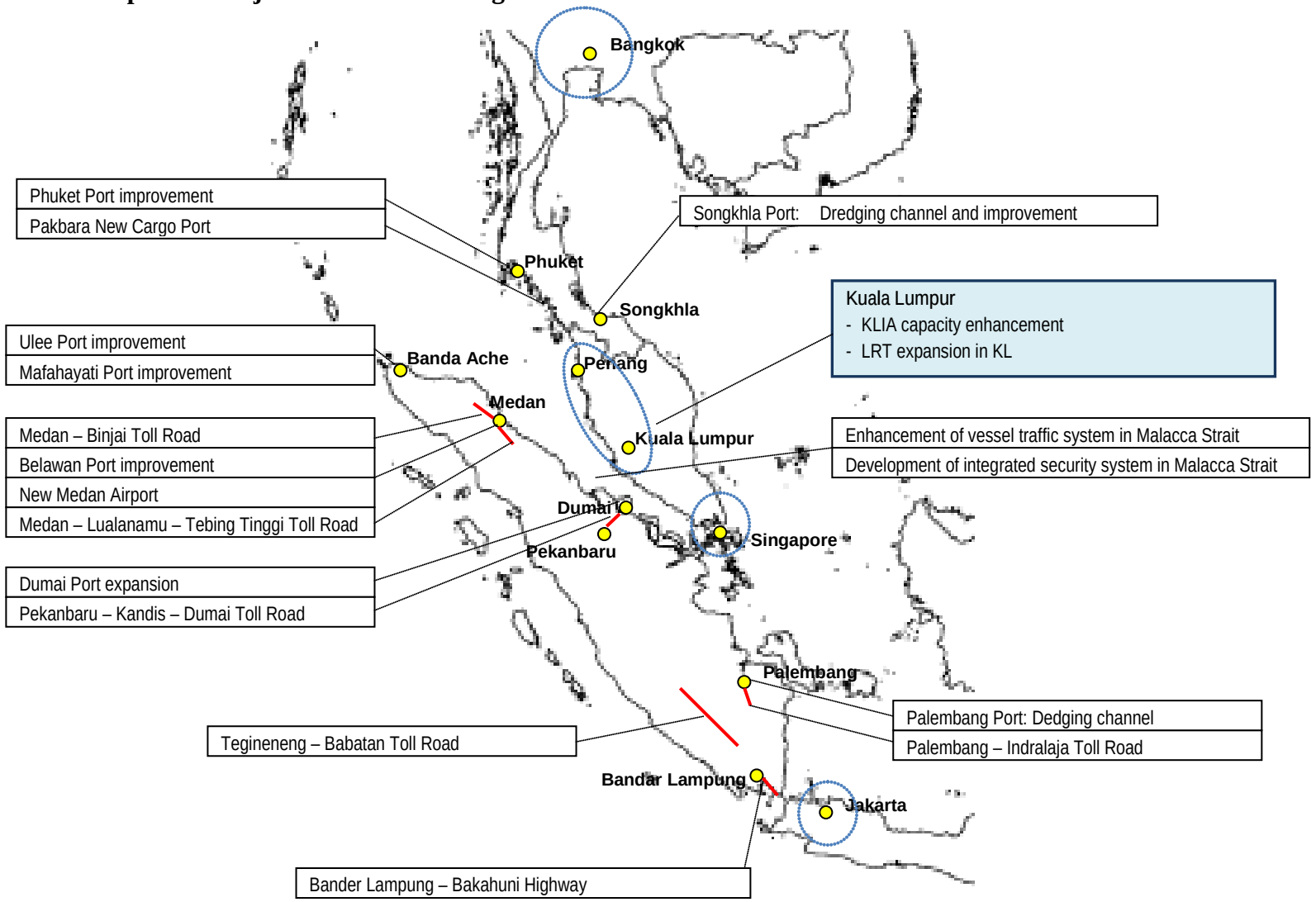
[3] Singapore, Johor (Malaysia), and Riau islands (Indonesia) have been known as SIJORI, or IMS-GT (Indonesia, Malaysia, and Singapore Growth Triangle). The concept of the grouping is similar to that of the CADP, as it focuses on how to make the best use of location advantages.

along the Trans Sumatera Highway are highlighted in Figure 6-2; that is, the Palembang – Indralaja section and the Bandar Lampung – Bakahuni section. The latter section is of particular importance, as Bakahuni is the gateway port to the island of Java, where another industrial agglomeration (Jakarta) exists.

These logistic infrastructure improvements are expected to facilitate the fragmentation of production blocks from the Tier 1 areas to Tier 2 areas, particularly in machinery industries. Enhanced connectivity to large markets would also help existing industries in Sumatera expand production. For example, rubber plantations, the rubber processing industry, and the coal mining industry will benefit from the closer access to neighboring industrial agglomerations such as Kuala Lumpur and Jakarta. As illustrated in Figure 4-2-5, these logistic improvements should not only drastically boost regional GDP in Sumatra but also spread out to other territories of IMT+ and beyond

Again, it should be stressed that the development of the physical infrastructure itself is insufficient to establish an efficient and reliable shipping network across the Strait of Malacca. A certain amount of soft infrastructure intended to maintain the safety and security of the shipping network will also be necessary. In addition, in order to establish international RO-RO routes, institutional arrangements on transport facilitation to allow cross border movement of trucks need to be implemented.

Figure 6-2. Selected Prospective Projects in IMT+ Sub-region



6-3-3. BIMP+ sub-region

The BIMP+ sub-region in the CADP is much larger than the Brunei Darussalam, Indonesia, Malaysia, of the Indonesia, Malaysia, and the Philippines East ASEAN Growth Area (BIMP-EAGA), in the sense that BIMP+ expands the geographical scope to include Manila and Jakarta (and Surabaya) as neighboring industrial agglomerations in the sub-region. In order to formulate an effective development strategy for the sub-region, it is necessary to take explicit account of the interaction with neighboring industrial agglomerations.

As compared to the Mekong and IMT+ sub-regions, the BIMP+ sub-region has a geographic disadvantage. As it consists of a number of islands in a wide geographic area, it is more difficult for BIMP+ to enhance intra-regional connectivity. In addition, industrial agglomerations (Tier 1) in BIMP+, Jakarta and Manila, are relatively less developed, when compared to those in other sub-regions. Therefore, there remains more room for physical infrastructure to contribute to upgrading existing industrial agglomerations in the BIMP+ sub-region.

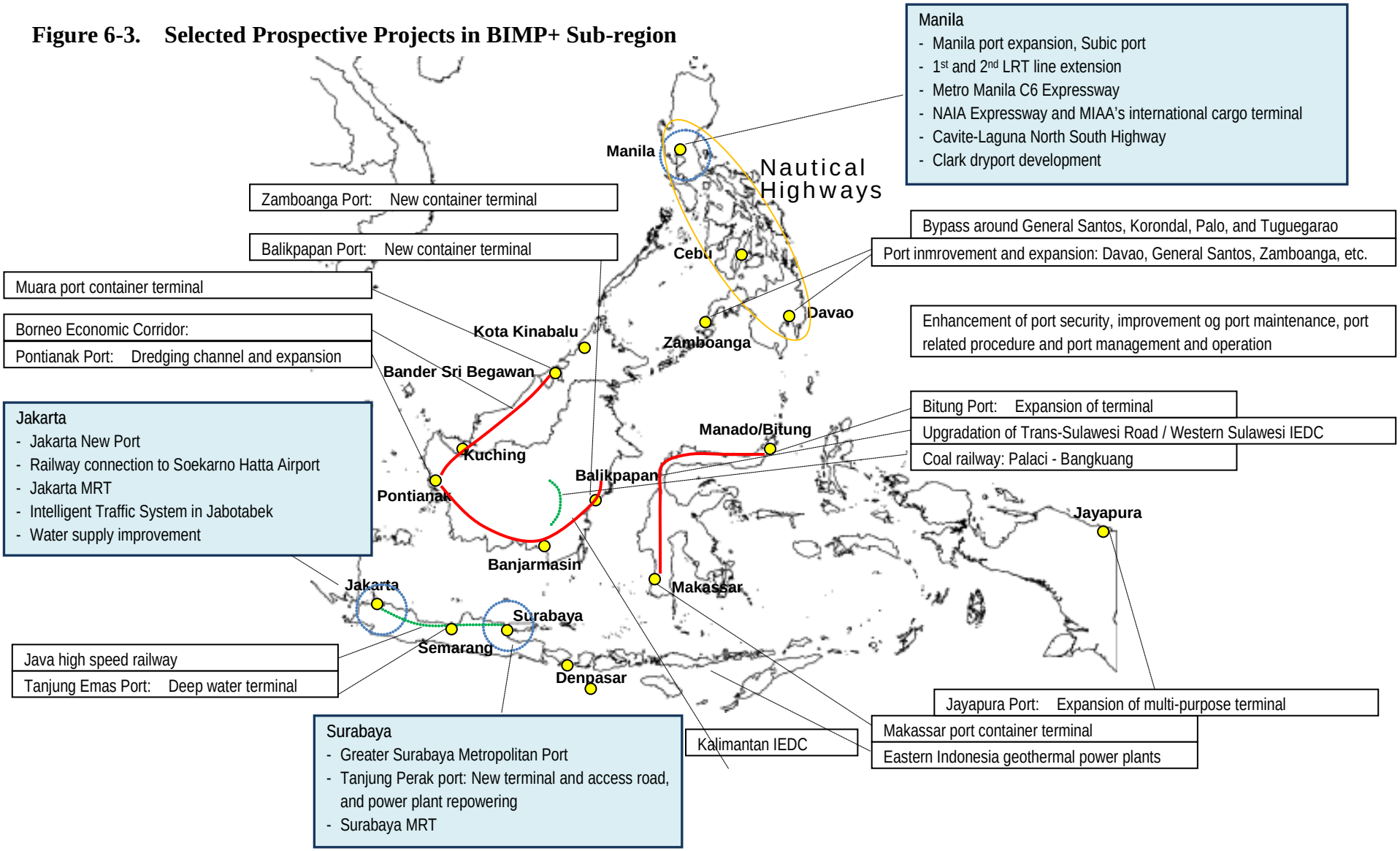
TanjungPriok Port in Jakarta, the gateway port to Indonesia, has long been at full capacity. A substantial expansion of the port, or the development of a new port, is of crucial importance for the development of Jakarta. In order to mitigate the congestion in Jakarta, a Mass Rapid Transport (MRT) system and an Intelligent Transport System (ITS) would be effective infrastructure developments. A railway connection from Soekarno-Hatta International Airport to Jakarta will also contribute to attracting more economic activity to Jakarta. Surabaya, the second largest city in Indonesia, can be regarded as an emerging industrial agglomeration, and shares similar problems with Jakarta. Here, the expansion of Tanjung Perak Port and the development of a MRT system are required. Manila also shares similar problems. It is important for Manila to upgrade urban infrastructure such as its Light Rail Transport (LRT) system and highways in the city, including the access roads to Manila Port and Ninoy Aquino International Airport.

Because the BIMP+ sub-region is an archipelago, participation in regional production networks is difficult. However, several cities in BIMP+, such as Bander Sri Begawan, Semarang, Makassar, Pontianak, Kota Kinabalu, Davao, and Cebu, have the potential to join regional production networks (Tier 2). In order to realize this scenario, BIMP+ should significantly enhance connectivity within the sub-region and with other parts of the region. Particularly, large islands such as Kalimantan, Sulawesi, and Papua need to enhance road networks within the islands, as illustrated in Figure 6-3 as the Borneo Economic Corridor, and Indonesia Economic Development Corridors (IEDC) in Kalimantan and West Sulawesi. At the same time, the major cities (Tier 1

and 2) need to be connected, both among themselves and with other parts of the region, by efficient and reliable shipping routes. Therefore, it is highly important to improve port infrastructure as indicated in Figure 6-3. A recent study conducted by ASEAN revealedthat most of the 47 designated ports in ASEAN need to be expanded or improved. In order to establish a transport network consisting of road and sea (RO-RO) transport, a number of lessons can be learned from the Philippines' experience in establishing the Nautical Highway Network (ADB, 2010). However, as mentioned above, it requires a number of additional institutional arrangements to establish international RO-RO networks.

A large part of BIMP+ can be regarded as Tier 3. A coal railway between Palaci and Bangkuan in Figure 6-3 is an example of facilitating the development of a Tier 3 region. Central Kalimantan is rich in coal. The proposed coal railway is expected to make the coal mining there more productive. The eastern part of Indonesia is known for its potential for geothermal power generation. This is also a strategy to make the best use of location advantage.

Figure 6-3. Selected Prospective Projects in BIMP+ Sub-region



APPENDIX 1. A LONG LIST OF PROSPECTIVE PROJECTS FOR LOGISTICS AND ECONOMIC INFRASTRUCTURE

Table A1-1-1a. Prospective projects in Mekong sub-region (Tier 1): Top priority

Country	Type	Sector	Sub-Sector	Project Name	
China	Public	Logistics	Road/Bridge	Western Guangxi road development	1,345
India	Public	Logistics	Railway	High speed railway: Chennai —Bangalore	
India	Public	Logistics	Road/Bridge	Expressway: Chennai − Bangalore	
India	Private	Logistics	Road/Bridge	Ennore Industrial Park and SEZ	
India	Private	Logistics	Road/Bridge	Chennai Port — Ennore Port accessway construction	270
India	Private	Logistics	Road/Bridge	Bangalore — Mysore Infrastructure Corridor (BMIC) and peripheral ring road (Phase I) in Bangalore	
India	Public	Logistics	Road/Bridge	Outer ring road in Chennai: Phase II	
India	Private	Logistics	Railway	Bangalore METRO: Phase II	
India	Private	Logistics	Airport	Sriperumbudur international airport	
India	Private	Logistics	Port/Maritime	Ennore Port containr terminal project: Phase I	630
India	Private	Other Economics	Industrial Estate/SEZ	Tamil Nadu — Andra Pradesh — Karnataka Integrated Industrial Region (TAK—IIR)	
India	Private	Other Economics	Industrial Estate/SEZ	Sri City (integrated business city)	
India	Private	Others		RFID TAG for logistics	
India	Public	Others		Disphatching project management experts	
Malaysia	Public	Logistics	Port/Maritime	Penang port: Expansion of container terminals	
Thailand	Private	Logistics	Airport	Suvarnabhumi airport: Phase 2	700
Thailand	Public	Logistics	Port/Maritime	Laem Chabang port: Phase 2, construction of container terminals C and D	274
Thailand	Public	Logistics	Railway	Bangkok MRT: Blue line (Bangsui—Tapra, Hualumpong—Bangkae)	2,594
Thailand	Public	Logistics	Railway	Bangkok MRT: Light green line (Morchit—Sapanmai)	792
Thailand	Public	Logistics	Railway	Bangkok MRT: Dark green line (Baring—Samutprakarn)	993

Thailand	Public	Logistics	Railway	Bangkok MRT: Orange line (Bangbumru—Bangkapi)	20,000
Thailand	Public	Logistics	Railway	Bangkok MRT: Extend dark green line (Tarksin—Bangwa—Putamonton 4)	647
Thailand	Public	Logistics	Railway	Bangkok MRT: Extend light green line (Sapanmai—Lumlukka)	528
Thailand	Public	Logistics	Railway	Bangkok MRT: Brown line (Saraya—Bangbumru) (Bangkapi—Minburi)	1,011
Thailand	Public	Logistics	Railway	Bangkok MRT: Extend purple line (Bangsui—Pomprachun)	2,627
Thailand	Public	Logistics	Railway	Bangkok MRT: Inner ring (Blue Line)	2,219
Thailand	Public	Logistics	Railway	Bangkok MRT: Outer ring (AD)	3,235
Thailand	Public	Logistics	Railway	Bangkok MRT: Extend red line (Hualumpong—Mahachai)	1,732
Thailand	Public	Logistics	Railway	Bangkok MRT: Extend green line (Samutprakarn—Bangpu)	132
Thailand	Public	Logistics	Road/Bridge	Highway management project: Additional financing	150
Thailand	Public	Other Economics	Energy/Power	Nuclear power plant	10,000
Thailand	Public	Other Economics	Industrial Estate/SEZ	IT and ITES park in Pathum Thani comprehensive development zone (CDZ)	100
Thailand	Public	Other Economics	Industrial Estate/SEZ	Pharma and Biotech City in Ayutthaya	80
Vietnam	Private	Logistics	Airport	Long Thanh international airport development	5,000
Vietnam	Private	Logistics	Airport	Cat Bi airport Improvement	35
Vietnam	Private	Logistics	Port/Maritime	Transshipment port in Vung Tau − Ba Ria province	250
Vietnam	Private	Logistics	Port/Maritime	Petroleum gas service port development in Sao Mai — Ben Dinh	1,000
Vietnam	Private	Logistics	Port/Maritime	Lach Huyen port development	13,982
Vietnam	Private	Logistics	Port/Maritime	Waterway Improvement in Red River: Ha Noi	346
Vietnam	Private	Logistics	Port/Maritime	Cai Mep — Thi Vai port: Improvement of operation and maintenance	274
Vietnam	Public	Logistics	Port/Maritime	Cai Mep —Thi Vai port: Upgrading of the channels	
Vietnam	Public	Logistics	Port/Maritime	Cai Lan Port: Additional installation of quay cranes	
Vietnam	Private	Logistics	Railway	SKRL missing link: HCMC — Loc Ninh (Cambodia border)	300
Vietnam	Private	Logistics	Railway	Railway: Trang Bom − Hoa Hung	550
Vietnam	Private	Logistics	Railway	Urban Railway: Hanoi − Noibai International Airport	938
Vietnam	Private	Logistics	Railway	Urban Railway: Hanoi − Lang Hoa Lac	938

Vietnam	Private	Logistics	Railway	Railway: Ho Chi Minh City — My Tho	447
Vietnam	Public	Logistics	Railway	Railway: Hanoi — Haiphong, phase 1	400
Vietnam	Public	Logistics	Railway	Railway: Ho Chi Minh City —Vung Tau (Cai Mep—Thi Vai port)	500
Vietnam	Public	Logistics	Railway	North — South high speed railway construction	56,000
Vietnam	Public	Logistics	Railways	Noi Bai International Airport: Terminal 2 construction	8,331
Vietnam	Private	Logistics	Road/Bridge	Bypass around Ho Chi Minh City	125
Vietnam	Private	Logistics	Road/Bridge	Expressway: Ha Noi — Lao Cai, phase I	653
Vietnam	Private	Logistics	Road/Bridge	Expressway: Noi Bai — Ha Long — Mong Cai	1,600
Vietnam	Private	Logistics	Road/Bridge	Expressway: Bien Hoa- Vung Tau	325
Vietnam	Private	Logistics	Road/Bridge	Expressway: Ben Luc — Long Thanh	1,200
Vietnam	Private	Logistics	Road/Bridge	Expressway: Gie — Ninh Binh section, phase 1	441
Vietnam	Private	Logistics	Road/Bridge	Expressway: Bac Ninh — Lang Son	1,400
Vietnam	Private	Logistics	Road/Bridge	Expressway: Ho Chi Minh City- Thu Dau Mot	125
Vietnam	Public	Logistics	Road/Bridge	Ha Noi — Lang Son Corridor: National road No.1	271
Vietnam	Private	Logistics	Road/Bridge	Do Xa – Quan Son Road	100
Vietnam	Private	Logistics	Road/Bridge	Ho Chi Minh City ring road No.3	1,550
Vietnam	Private	Logistics	Road/Bridge	National road No.6 improvement: Ba La — Xuan Mai	45
Vietnam	Private	Logistics	Road/Bridge	Dinh Vu Bridge	97
Vietnam	Private	Logistics	Road/Bridge	Vinh Thinh Bridge	59
Vietnam	Private	Logistics	Road/Bridge	Expressway: Trung Luong — My Tuan	1,000
Vietnam	Public	Logistics	Road/Bridge	Road construction to connect Noi Bai international airport and Nhat Tan Bridge	3,237
Vietnam	Private	Other Economics	Energy/Power	Nhon Trach thermal power plant IPP project	275
Vietnam	Private	Other Economics	Energy/Power	Song Hau 1 Coal—fired power plant	1,800
Vietnam	Public	Other Economics	Energy/Power	Can Tho — Ho Chi Minh City transmission line (500kV)	75
Vietnam	Public	Other Economics	Energy/Power	Tinh Ninh Thuan nuclear power plant	20,000

Vietnam	Public	Other Economics	Energy/Power	Ho Chi Minh City ultra high voltage transmission line construction	1,000
Vietnam	Public	Other Economics	Industrial Estate/SEZ	Hoa Lac high-tech park	186
Vietnam	Public	Other Economics	Industrial Estate/SEZ	Software Technology Park in Ho Chi Minh City	80
Vietnam	Public	Other Economics	Industrial Estate/SEZ	Petro—chemical complex in Ba Ria — Vung Tau	300
Vietnam	Public	Other Economics	Industrial Estate/SEZ	Vietnam space center project in Hoa Lac high-tech park	366
Vietnam	Private	Other Economics	Telecommunication	Enhancement of ICT infrastructure in Hanoi	266

Table A1-1-1b. Prospective projects in Mekong sub-region (Tier 1): Priority

Country	Type	Sector	Sub-Sector	Project Name	Cost
India	Public	Logistics	Port/Maritime	Tuticorin Port	
India	Public	Logistics	Railway	Southern (Chennai − Goa) DFC	
India	Private	Other Economics	Energy/Power	Chennai —Bangalore —Mangalore gas pipeline	
India	Public	Other Economics	Energy/Power	Dabhol —Bangalore gas pipeline	
India	Public	Other Economics	Energy/Power	Bay of Bengal fuel corridor	
India	Public	Urban and Social	Water Supply/Sanitation	Disalination project in Chennai — Bangalore	
Thailand	Public	Logistics	Railway	Railway: Map Ta Phut − Rayong (24 km)	275
Thailand	Public	Logistics	Road/Bridge	Multimodal logistics park in Chachoengsao —Prachinburi	70
Thailand	Public	Logistics	Road/Bridge	Chao Phraya River crossing bridge at Nonthaburi 1 road construction project	2,047
Vietnam	Public	Logistics	Port/Maritime	Upgrading of southern inland waterway ports (Ho Chi Minh, Ca Mau, Vinh Long, An Giang and	79

				Dong Thap)	
Vietnam	Private	Logistics	Railway	High speed railway: Lao Cai ― Hanoi ― Hai Phong	530
Vietnam	Private	Logistics	Railway	Improvement Project of Rail Freight Transport for Hanoi − Hai Phong in the Socialist Republic of Viet Nam	275
Vietnam	Private	Logistics	Railway	Railway freight transport system construction project for the improvement of distribution efficiency in the southern focal economic zone	275
Vietnam	Public	Logistics	Railway	Railway upgrading: Ha Noi ― Thai Nguyen	275
Vietnam	Public	Logistics	Road/Bridge	Highway: Hanoi ―Thai Nguyen	271
Vietnam	Private	Other Economics	Energy/Power	2 x 600 MW Son My thermal power plant (Unit 1 ― 2)	1,500
Vietnam	Private	Other Economics	Energy/Power	New coal fired thermal power plant in Quang Ninh province: Phase 2	275
Vietnam	Public	Other Economics	Energy/Power	Soc Trang I gas power plant (1200MW)	1,450
Vietnam	Public	Other Economics	Energy/Power	2 x 600 MW Son My thermal power plant (Unit 3 ― 4)	1,500
Vietnam	Public	Other Economics	Energy/Power	100 MW hydro power plant in Lam Dong province	180
Vietnam	Public	Other Economics	Energy/Power	High voltage transmission line construction project (North ―South, South Region)	
Vietnam	Public	Other Economics	Energy/Power	Power sector loan (III)	
Vietnam	Public	Other Economics	Energy/Power	Nghi Son thermal power plant construction project (II)―(V)	11,935
Vietnam	Public	Other Economics	Energy/Power	Thai Binh thermal power plant & transmission lines construction project (II)―(IV)	8,220
Vietnam	Public	Other Economics	Industrial Estate/SEZ	Mega Industrial Zone at Bien Hoa CDZ	1,400
Vietnam	Private	Urban and Social	Water Supply/Sanitation	PPP project formation for Hanoi water supply system	279

Vietnam	Public	Urban and Social	Water Supply/Sanitation	Hanoi City disposal ability improvement project	279
Vietnam	Public	Urban and Social	Water Supply/Sanitation	Hanoi City sewerage system construction project	279
Vietnam	Public	Urban and Social	Water Supply/Sanitation	Urban drainage and sewerage system for Ho Chi Minh City	279
Vietnam	Public	Urban and Social	Water Supply/Sanitation	Urban drainage and sewerage system for Hanoi	279

Table A1-1-1c. Prospective projects in Mekong sub-region (Tier 1): Normal

Country	Type	Sector	Sub-Sector	Project Name	Cost
India	Private	Other Economics	Energy/Power	K.G. Basin—Chennai—Tuticorin gas pipeline	
Thailand	Public	Logistics	Road/Bridge	Bangkok south part ring road developent	271

Table A1-1-2a. Prospective projects in Mekong sub-region (Tier 2): Top priority

Country	Type	Sector	Sub-Sector	Project Name	Cost
Cambodia	Public	Logistics	Airport	Upgrading of Sihanoukville airport	272
Cambodia	Public	Logistics	Railway	SKRL missing link: Bat Deng (Phnom Penh) — Loc Ninh (255 km)	500
Cambodia	Public	Logistics	Railway	SKRL missing link: Poipet — Sisophon (48km)	
Cambodia	Private	Logistics	Road/Bridge	Upgradation of road link between Phnom Penh and Sihanoukville port from 2−lane to 4−lane as access controlled expressway	300
Cambodia	Public	Logistics	Road/Bridge	Bypass around Phnom Penh city	90
Cambodia	Public	Logistics	Road/Bridge	Reconstruction of national road No.3 (Phnom Penh — Kampot)	68
Cambodia	Public	Logistics	Road/Bridge	Mekong Bridge in Takmov (Phnom Penh)	55
Cambodia	Public	Logistics	Road/Bridge	Mekong Bridge in Neak Loeung	
Cambodia	Public	Other Economics	Energy/Power	Transmission line (230 kV) double circuits link between Kampot and Sihanoukville	35

Cambodia	Public	Other Economics	Industrial Estate/SEZ	Industrial Estate in Koh Kong (Thaii border)	63
Cambodia	Public	Other Economics	Industrial Estate/SEZ	Industrial Estate in Poipet (Thai border)	91
Cambodia, Thailand	Public	Other Economics	Energy/Power	Stung Meteuk I hydropower plant	317
Cambodia, Thailand	Public	Other Economics	Energy/Power	Gas pipeline: Ayuthaya — Sakeo — Poipet (Cambodia)	56
Cambodia, Thailand	Public	Other Economics	Energy/Power	Gas pipeline: Maptaphut — Chantaburi — Koh Kong (Cambodia)	65
Cambodia, Vietnam	Public	Logistics	Road/Bridge	Cross border facilities at Moc Bai — Bavet	20
Combodia	Public	Logistics	Port/Maritime	Revitalization of Phnom Penh port: Container terminal	
Combodia	Public	Logistics	Port/Maritime	Expansion of Sihanoukville port: Extension of container terninal berth, additional quay cranes	
Laos	Public	Logistics	Airport	Savannakhet airport improvement: Phase I	17
Myanmar	Public	Logistics	Port/Maritime	New Dawei deepwater port	274
Myanmar	Public	Logistics	Port/Maritime	Thilawa port: Terminal development and enhancement of management	
Myanmar	Public	Logistics	Port/Maritime	Yangon port: Installation of quay cranes	
Myanmar	Public	Logistics	Road/Bridge	Development of road links from Dawei port to Bong Tee (Thailand border) and road from Bong Tee to Kanchanaburi in Thailand as 4−lane access controlled expressways	400
Thailand	Public	Logistics	Port/Maritime	The coastal channels and ports development	482
Vietnam	Private	Logistics	Airport	Da Nang international airport: Construction of passenger terminal	84
Vietnam	Private	Logistics	Port/Maritime	Construction of international container port in Van Phong, Khanh Hoa Province	197
Vietnam	Private	Logistics	Port/Maritime	Lien Chieu port development	300
Vietnam	Private	Logistics	Port/Maritime	Ky Ha port (Chu Lai) development	800
Vietnam	Public	Logistics	Port/Maritime	Da Nang port improvement project (II)	274
Vietnam	Private	Other Economics	Energy/Power	O Mon 2 combined cycle power plant as joint venture IPP	275

Vietnam	Private	Other Economics	Energy/Power	Nghi Son thermal power plant construction project, phase II	1,500
Vietnam	Public	Other Economics	Energy/Power	O Mon thermal power plant and Mekong delta transmission network project	998
Combodia, India, Myanmar, Vietnam	Public	Logistics	Port/Maritime	Enhancement of port security	
Combodia, India, Myanmar, Vietnam	Public	Logistics	Port/Maritime	Improvement of port maintenance	
Combodia, India, Myanmar, Vietnam	Public	Logistics	Port/Maritime	Improvement of port related procedure	
Combodia, India, Myanmar, Vietnam	Public	Logistics	Port/Maritime	Improvement of port management and operation	

Table A1-1-2b. Prospective projects in Mekong sub-region (Tier 2): Priority

Country	Type	Sector	Sub-Sector	Project Name	Cost
Cambodia	Public	Logistics	Industrial Estate/SEZ	Sihanoukville port free zone	24
Cambodia	Private	Logistics	Road/Bridge	Improvement of efficiency and security of customs clearance and logistics	30
Cambodia	Public	Logistics	Road/Bridge	Highway rehabilitation: National road No.72	6
Cambodia	Public	Logistics	Road/Bridge	Urgent bridge rehabilitation program	10
Cambodia	Public	Logistics	Road/Bridge	Rehabilitation of national road No.5 from Prek Kdam Bridge to Kompong Chhnang and from Svay Sisophon to Battambang	

Cambodia	Public	Logistics	Road/Bridge	Improvement of national road No.1	880
Cambodia	Public	Other Economics	Energy/Power	Diesel power plant in Sihanoukville	77
Cambodia	Public	Other Economics	Energy/Power	300 kW PV solar power plant in Svay Rieng	2
Cambodia	Public	Other Economics	Energy/Power	600 kW bio—gas power project in Battambang	2
Cambodia	Public	Other Economics	Energy/Power	Construction of transmission loop line system around Phnom Penh	85
Cambodia	Public	Other Economics	Industrial Estate/SEZ	Industrial estate in Ban Laem — Kamrieng or in Ban Pakkad—Pailin (Thai border)	167
Cambodia	Public	Other Economics	Industrial Estate/SEZ	Industrial zone in Sihanoukville	35
Cambodia	Public	Other Economics	Telecommunication	Fibre optic cable between Phnom Penh and Sihanoukville	10
Cambodia	Private	Urban and Social	Medical	Human Resource Development and Hospital Project	50
Cambodia, Vietnam	Public	Other Economics	Energy/Power	Lower Sre Pok 2 hydropower plant	353
Cambodia, Vietnam	Public	Other Economics	Energy/Power	Lower Se San 2 hydropower plant	393
Cambodia, Vietnam	Public	Other Economics	Energy/Power	Upgrading of Thailand — Bantey Meanchey — Siem Reap — Battambang transmission line (115kV) from single to double circuit	30
Cambodia/Laos/Thailand/Vietnam	Public	Other Economics	Energy/Power	Greater Mekong power transmission network development project	
China, Vietnam	Public	Other Economics	Energy/Power	Interconnection project: Malutang (Yunnan) to Viet Nam	68
India	Private	Other Economics	Energy/Power	MICRO grid installation project	
India	Private	Other Economics	Industrial Estate/SEZ	Mahindra World City	

India	Private	Other Economics	Industrial Estate/SEZ	L&T SEZ and shipyard	
Laos	Public	Logistics	Airport	Development of CNS/ATM systems	88
Laos	Public	Logistics	Airport	Vientiane international airport security and safety improvement	100
Laos	Public	Other Economics	Energy/Power	GMS northern power transmission (Lao PDR)	20
Laos	Private	Other Economics	Industrial Estate/SEZ	SEZ development in border area (Savannakhet Province)	63
Laos	Private	Other Economics	Telecommunication	Mekong ICT project	4
Myanmar	Public	Logistics	Airport	Upgrading of Dawei airport	55
Myanmar	Public	Other Economics	Energy/Power	Gas—fired power plant (700MW) in Dawei	560
Myanmar	Public	Other Economics	Industrial Estate/SEZ	SEZ/FTZ and international trade exchange center in Dawei	600
Myanmar, Thailand	Public	Other Economics	Energy/Power	Interconnection project: Tasang hydropower plant — Mae Moh—Tha Tako	323
Vietnam	Public	Logistics	Airport	Upgrading of Na San airport in Dien Bien Phu	272
Vietnam	Public	Logistics	Port/Maritime	Upgrading of Can Tho port	10
Vietnam	Private	Logistics	Railway	Railway Tunnel: Hai Van	200
Vietnam	Private	Logistics	Road/Bridge	Expressway: Ninh Binh — Thanh Hoa —Vinh	960
Vietnam	Private	Logistics	Road/Bridge	Expressway: Dau Day — Da Lat	500
Vietnam	Private	Logistics	Road/Bridge	Expressway: Quang Tri — Hue — Da Nang	750
Vietnam	Private	Logistics	Road/Bridge	Expressway: Da Nang — Quang Ngai	755
Vietnam	Private	Logistics	Road/Bridge	Expressway: Dau Giay — Binh Thuan — Nha Trang	200
Vietnam	Private	Logistics	Road/Bridge	National road No.20 improvement: Dau Giay — Lien Khuong	26
Vietnam	Public	Logistics	Road/Bridge	GMS Kunming—Haiphong Transport Corridor: Noi Bai — Lao Cai	638
Vietnam	Public	Logistics	Road/Bridge	GMS Southern Coastal Corridor	150
Vietnam	Public	Logistics	Road/Bridge	Highway: Ninh Binh- Thanh Hoa	271

Vietnam	Public	Logistics	Road/Bridge	North South Expressway: Da Nang ― Quang Ngai	
Vietnam	Public	Other Economics	Energy/Power	Nhon Trach 4 combined cycle power plant (720 MW)	450
Vietnam	Public	Other Economics	Energy/Power	Nyokie hydropower plant	140
Vietnam	Public	Other Economics	Energy/Power	Mekong region power transmission network project	
Vietnam	Private	Other Economics	Industrial Estate/SEZ	Bac Cam Ranh industrial estate	15
Vietnam	Public	Other Economics	Industrial Estate/SEZ	Moc Bai cross―border economic zone	34
Vietnam	Public	Other Economics	Industrial Estate/SEZ	Ca Mau industrial park	301

Table A1-1-2c. Prospective projects in Mekong sub-region (Tier 2): Normal

Country	Type	Sector	Sub-Sector	Project Name	Cost
Cambodia	Public	Logistics	Port/Maritime	Improvement of ports and maritime safety	
Cambodia	Private	Logistics	Railway	Phnom Penh city skyrail airport line project	275
Cambodia	Public	Logistics	Railway	Rail link: Sisophon ―Siem Reap (105 km)	275
Cambodia	Public	Logistics	Railway	Rail link: Siem Reap ―Skun (239 km)	275
Cambodia	Public	Logistics	Railways	Project for public transportation service in Phnom Penh	
Cambodia	Public	Logistics	Railways	Project for urban transport planning in the municipality of Phnom Penh	
Cambodia	Public	Logistics	Road/Bridge	GMS northern sub-corridor in Cambodia: Siem Reap ―Stung Treng	271
Cambodia	Public	Logistics	Road/Bridge	Improvement of existing bridges along national roads	
Cambodia	Public	Logistics	Road/Bridge	Project for installment of road traffic sign	
Cambodia	Private	Other Economics	Energy/Power	Coal fired power plant (500MW) in Sihanoukeville	600

Cambodia	Public	Other Economics	Energy/Power	Tramsmission lines project	3
Cambodia	Public	Other Economics	Energy/Power	Combined cycle power plant (180MW) in Sihanoukville	200
Cambodia	Public	Other Economics	Energy/Power	Gas pipeline link between Block A (offshore Cambodia) and Sihanoukville (140km)	150
Cambodia	Public	Other Economics	Industrial Estate/SEZ	Industrial promotion centre	12
Cambodia	Public	Other Economics	Industrial Estate/SEZ	Urban growth triangle feasibility study in Sisophon, Siem Reap and Battambang	1
Cambodia	Private	Other Economics	Telecommunication	Telecommnunications network development covering the growth corridor areas	266
Cambodia	Public	Other Economics	Telecommunication	Expansion of national optical fiber backbone	38
Cambodia	Public	Other Economics	Telecommunication	Public calling offices (PCOs)	9
Cambodia	Public	Other Economics	Telecommunication	Optical submarine cable system	20
Cambodia	Public	Other Economics	Telecommunication	GMS ICT project	35
Cambodia	Private	Urban and Social	Water Supply/Sanitation	Introducing private sector participation for the development of Sihanoukville water supply	279
Cambodia, Thailand, Vietnam	Public	Other Economics	Telecommunication	Telecommunications backbone development: Bangkok ― Phnom Penh ― HCMC	266
Cambodia, Vietnam	Public	Other Economics	Energy/Power	Cambodia ―Viet Nam power interconnection	55
China	Public	Logistics	Airport	Kunming airport	1,600
Laos	Public	Logistics	Railways	Improvement of transportation capacity of public bus in Vientiane Capital	37
Laos	Private	Logistics	Road/Bridge	Physical distribution base of Savannakhet and Vientiane	271
Laos	Public	Logistics	Road/Bridge	National road No.1 from Vientiane capital to Kao Leo and to the Friendship Bridge.	271

Laos	Public	Logistics	Road/Bridge	21 new bridges along route No.9 in Savannakhet province	271
Laos	Public	Logistics	Road/Bridge	Improvement of national road No.9: East West Economic Corridor	300
Laos	Public	Logistics	Road/Bridge	Construction of Pakhayeung bridge in Vientiane Province	130
Laos	Public	Other Economics	Energy/Power	Upgrading of transmission system (115kV) in and around Thakek	275
Laos	Public	Other Economics	Energy/Power	Nam Theun 2 and Nam Ngum 2 hydropower plant projects	275
Laos	Public	Other Economics	Energy/Power	Small and medium scale hydropower plants in Sebanghiang	275
Laos	Public	Other Economics	Energy/Power	Hydropower plants in Xexet 2, Sekong 3, Sekong 4 and Sekong 5	275
Laos	Public	Other Economics	Energy/Power	South ―central power network development project	130
Laos	Public	Other Economics	Industrial Estate/SEZ	Feasibility study on SEZ/industrial base in Savan ― Seno	275
Laos	Public	Other Economics	Industrial Estate/SEZ	Border trading zone in Dansavanh (Savannakhet)	275
Laos / Thailand	Public	Logistics	Road/Bridge	Fourth international Mekong bridge: Houayxay ―Chiang Khong	40
Laos, China, Thailand	Public	Other Economics	Energy/Power	GMS power transmission line between Laos, China, and Thailand	300
Laos, Myanmar, Thailand, Viet Nam	Public	Other Economics	Industrial Estate/SEZ	Harmonization of industrial zone management policies and rationalizing industrial zones	1
Laos, Thailand, Vietnam	Public	Other Economics	Energy/Power	Natural gas pipeline distribution system for the East West Economic Corridor	250
Laos, Thailand, Vietnam	Public	Other Economics	Energy/Power	GMS Power Interconnection Project Phase I Construction (Lao PDR− Viet Nam Power Interconnection)	271
Myanmar	Public	Logistics	Road/Bridge	Multimodal logistics park in Dawei	105

Myanmar	Public	Logistics	Road/Bridge	AH1: Upgrading of Kalay/Kalewa—Monywa section	40
Myanmar	Public	Logistics	Road/Bridge	Route No.8: Kawkareik—Mawlamyine—Thaton	271
Myanmar	Public	Other Economics	Energy/Power	Hydropower plant (600MW) in Taninthyari (Thai border)	800
Myanmar	Public	Other Economics	Industrial Estate/SEZ	Special Border Zone (SBZ) in Myawaddy, Myanmar	10
Myanmar, China, Vietnam	Public	Other Economics	Telecommunication	Telecommunication backbone project: Phase II (China, Laos, Myanmar, Thailand and Vietnam)	65
Thailand	Public	Logistics	Airport	Airport development in the Kingdom of Thailand	720
Thailand	Private	Logistics	Railway	State cargo railway (Korat —Laem Chabang port)	120
Thailand	Public	Logistics	Railway	Rail link: Denchai — Chiang Rai (246 km)	275
Thailand	Public	Logistics	Railway	Rail link: Bua Yai — Roi Et — Mukdahan — Nakhon Phanom (368 km)	275
Thailand	Public	Logistics	Railways	Track rehabilitation and doubling track project	1,000
Thailand	Public	Logistics	Road/Bridge	Highway No.3: Trat —Hat Lek (Cambodia border)	271
Thailand	Public	Other Economics	Energy/Power	Interconnection project: Udon Thani —Na Bon	84
Thailand	Public	Other Economics	Industrial Estate/SEZ	Feasibility study for the establishment of a Special Border Economic Zone in Chiang Rai	
Thailand	Public	Other Economics	Industrial Estate/SEZ	Feasibility study for the establishment of an industrial estate in Chiang Saen district (Chiang Rai)	
Thailand	Public	Other Economics	Industrial Estate/SEZ	Establishment of Special Border Economic Zone in Chiang Rai: Establishment of Industrial Estate	301
Thailand	Public	Other Economics	Industrial Estate/SEZ	Special Border Zone (SBZ) in Mae Sot, Thailand	30
Thailand	Public	Other Economics	Industrial Estate/SEZ	Feasibility study on the establishment of Special Border Economic Zone (SBEZ) in Mae Sot District (Tak Province)	0
Thailand, Cambodia	Public	Logistics	Road/Bridge	Construction of cross —border facilities at Aranyaprathet —Poipet	20
Thailand, Myanmar	Public	Logistics	Railway	Rail link: Nam Tok —Dawei	650

Thailand, Myanmar	Public	Logistics	Road/Bridge	Construction of cross—border facilities at Ban Bon Tee (Thai—Myanmar border)	20
Thailand, Myanmar, Laos, Cambodia	Private	Other Economics	Telecommunication	lntemet telephony infrastructure in Thailand and neighboring couutries	266
Vietnam	Public	Logistics	Port/Maritime	Tamron Ben Cat canal improvement project	274
Vietnam	Public	Logistics	Port/Maritime	Port development plan in the key area of the central region	428
Vietnam	Public	Logistics	Port/Maritime	Coastal shipping rehabilitation and development project	1,756
Vietnam	Public	Logistics	Port/Maritime	Upgrading Pein river channel	274
Vietnam	Public	Logistics	Railway	Rehabilitation and improvement of railway in Viet Nam	1,689
Vietnam	Public	Logistics	Railway	Upgrade of Raillink: Kep — Luu Xa	275
Vietnam	Private	Logistics	Road/Bridge	Expressway: Dau Giay — Da Lat	1,000
Vietnam	Private	Logistics	Road/Bridge	Van Tien Bridge	271
Vietnam	Private	Logistics	Road/Bridge	Southern inter-regional highway including Binh Khanh and Phuc Khanh Bridge	271
Vietnam	Public	Logistics	Road/Bridge	Transportation links improvement project	271
Vietnam	Public	Logistics	Road/Bridge	Car pass tunnel construction project	271
Vietnam	Public	Logistics	Road/Bridge	National Highway No.2 development project	271
Vietnam	Public	Logistics	Road/Bridge	Highway: Dau Giay (Dong Lai) — Da Lat (Lam Dong)	271
Vietnam	Public	Logistics	Road/Bridge	Van Thien Bridge	271
Vietnam	Public	Logistics	Road/Bridge	Road improvement project: Da Nang — Hue	271
Vietnam	Public	Logistics	Road/Bridge	National Road No.14 improvement project	271
Vietnam	Public	Logistics	Road/Bridge	Upgrading of national highways No.2, 3, 6, 32	271
Vietnam	Public	Logistics	Road/Bridge	Gie Bridge	271
Vietnam	Public	Logistics	Road/Bridge	National Road 1A, 60, N1, N2	271
Vietnam	Public	Logistics	Road/Bridge	Upgrading of all provincial and national highways	271
Vietnam	Public	Logistics	Road/Bridge	Upgrading of all national roads, provincial roads and waterways bypassing cities and towns along national road No.1	271
Vietnam	Public	Logistics	Road/Bridge	Expressway: Da Nang —Quang Ngai	1,300
Vietnam	Public	Logistics	Road/Bridge	Viet Nam EWEC Other Highway Projects	700

Vietnam	Public	Logistics	Road/Bridge	Northern Subcorridor: Play Ku —Quy Nhon	120
Vietnam	Public	Logistics	Road/Bridge	North South Expressway: Ben Luc —Long Thanh	
Vietnam	Public	Logistics	Road/Bridge	North South Expressway: Ninh Binh — Ha Tinh	
Vietnam	Public	Other Economics	Energy/Power	Wind based power plant (3MW) in Binh Thuan	5
Vietnam	Public	Other Economics	Energy/Power	Construction of Thuong Kom Tum hydropower plant	275
Vietnam	Public	Other Economics	Energy/Power	Construction of Se San 4 hydropower plant	275
Vietnam	Public	Other Economics	Energy/Power	Construction of An Khe Kra Nac hydropower plant	275
Vietnam	Public	Other Economics	Energy/Power	Construction of Sre Pok 3 hydropower plant	275
Vietnam	Public	Other Economics	Energy/Power	Construction of Sre Pok 4 hydropower plant	275
Vietnam	Public	Other Economics	Energy/Power	O Mon Thermal Power Plant (O Mon 1 and 2)	600
Vietnam	Public	Other Economics	Energy/Power	Nhon Trach 3 combined cycle power plant (720 MW)	450
Vietnam	Public	Other Economics	Energy/Power	Nghi Son thermal power plant construction project (I)	851
Vietnam	Public	Other Economics	Energy/Power	Phu Yen Dong pumping power plant	275
Vietnam	Public	Other Economics	Energy/Power	Bac Ai pumping power plant	275
Vietnam	Public	Other Economics	Energy/Power	Son La hydropower plant	275
Vietnam	Public	Other Economics	Energy/Power	Hydropower plants in the watershed of Da and Lo Rivers	275
Vietnam	Public	Other Economics	Energy/Power	Develop small and medium−scale hydropower plants	275

Vietnam	Public	Other Economics	Energy/Power	Develop coal—fired thermal power plants	275
Vietnam	Public	Other Economics	Energy/Power	Trung Son hydropower plant	375
Vietnam	Public	Other Economics	Energy/Power	O Mon Thermal Power Plant Project (3 or 4)	1,000
Vietnam	Private	Other Economics	Industrial Estate/SEZ	Non—tariff area development in Vung Ang port and Son Duong port	301
Vietnam	Private	Other Economics	Industrial Estate/SEZ	Steel flat product mills: Phase I, F/S on cold rolling mill	126
Vietnam	Private	Other Economics	Industrial Estate/SEZ	Industrial Estate Development: Hoa Khuong	301
Vietnam	Public	Other Economics	Industrial Estate/SEZ	Timber complex in Lao Bao industrial zone, Quang Tri	2
Vietnam	Public	Other Economics	Industrial Estate/SEZ	Building of warehouses in Lao Bao SEZ	25
Vietnam	Public	Other Economics	Industrial Estate/SEZ	Expansion of Lien Chieu and Hoa Khanh Industrial Zones, Da Nang	20
Vietnam	Public	Other Economics	Industrial Estate/SEZ	Developing the remaining infrastructure part of Lien Chieu Industrial Zone	40
Vietnam	Public	Other Economics	Industrial Estate/SEZ	Small and Medium Industry (SMI) Park in Phu Bai Industrial Zone, Hue	17
Vietnam	Public	Other Economics	Industrial Estate/SEZ	Chan May trade development promotion zone	100
Vietnam	Public	Other Economics	Industrial Estate/SEZ	Thuong Phuoc free trade area Promotion	1
Vietnam	Public	Other Economics	Industrial Estate/SEZ	Trang Bang industrial estate	7
Vietnam	Public	Other Economics	Industrial Estate/SEZ	Tram Vang industrial estates	43
Vietnam	Public	Other Economics	Industrial Estate/SEZ	Sa Mat Cross —Border Economic Zone	12

Vietnam	Public	Other Economics	Industrial Estate/SEZ	Than Phu Trung industrial estate	82
Vietnam	Public	Other Economics	Industrial Estate/SEZ	Hoa Lac hightech park	301
Vietnam	Public	Other Economics	Industrial Estate/SEZ	Develop industrial zones along National Highways No.18, 5, 1, 10	301
Vietnam	Public	Other Economics	Industrial Estate/SEZ	Establish Van Don economic complex (Quang Ninh)	301
Vietnam	Public	Other Economics	Industrial Estate/SEZ	Nam Dinh city industrial center	301
Vietnam	Public	Other Economics	Industrial Estate/SEZ	Establish Economic Zones in Vung Ang, Chan May—Lang Co, Chu Lai, Dzung Quat, Nhon Hoi and Van Phong	301
Vietnam	Public	Other Economics	Industrial Estate/SEZ	Trade centers in Vinh, Hue, Da Nang, Quy Nhon, Nha Trang, and Phan Thiet	301
Vietnam	Public	Urban and Social	Water Supply/Sanitation	Ha Long City sanitation improvement project	279
Vietnam	Public	Urban and Social	Water Supply/Sanitation	Cao Lanh city (Dong Thap province) water emvironmental improvement project	279
Vietnam	Public	Urban and Social	Water Supply/Sanitation	Urban drainage and sewerage system for Bien Hoa city	279
Vietnam	Public	Urban and Social	Water Supply/Sanitation	Water emvironmental improvement project for Can Tho city	279
Vietnam	Public	Urban and Social	Water Supply/Sanitation	Flood control canals in Dong Thap Muoi, Long Xuyen Tetragon	279

Table A1-1-3a. Prospective projects in Mekong sub-region (Tier 3): Top priority

Country	Type	Sector	Sub-Sector	Project Name	Cost
India	Private	Logistics	Road/Bridge	Northern port access road	

Table A1-1-3b. Prospective projects in Mekong sub-region (Tier 3): Priority

Country	Type	Sector	Sub-Sector	Project Name	Cost
Cambodia	Public	Logistics	Road/Bridge	Rehabilitation of national road No.57: Batambang — Paylin — Thai border	15
India	Private	Logistics	Road/Bridge	Ennore Manali road and NCTPS (North Chennai Thermal Power Station) road imporvement	
Myanmar	Public	Logistics	Port/Maritime	Kyaulphu port: Upgrading the jetty	
Myanmar	Public	Logistics	Port/Maritime	Mawlamyine port: Making the plan for port development	
Vietnam	Private	Logistics	Airport	Chu Lai international airport development	1,000
Vietnam	Private	Logistics	Airport	Cam Ranh international airport improvement	190
Vietnam	Public	Logistics	Port/Maritime	Vung Ang port expansion	7

Table A1-1-3c. Prospective projects in Mekong sub-region (Tier 3): Normal

Country	Type	Sector	Sub-Sector	Project Name	Cost
Cambodia	Public	Logistics	Airport	Mondolkiri airport development	38
Cambodia	Public	Logistics	Airport	Preah Vihea airport improvement	9
Cambodia	Public	Logistics	Airport	Stung Treng airport improvement	6
Cambodia	Public	Logistics	Airport	Kraches airport improvement	7
Cambodia	Public	Logistics	Airport	Ratanakiri airport improvement	56
Cambodia	Public	Logistics	Port/Maritime	Improvement and promotion of navigation between Cambodia and Vietnam	1
Cambodia	Public	Logistics	Port/Maritime	Dredging access of Mekong channels and islands	5
Cambodia	Public	Logistics	Port/Maritime	Chong Khneas port improvement	15
Cambodia	Public	Logistics	Port/Maritime	Tonlesap Lake waterways improvement	12
Cambodia	Public	Logistics	Port/Maritime	Development of port facilities along the Mekong, Basac, Tonlesap river	9
Cambodia	Public	Logistics	Port/Maritime	Dredging Sdeo drainage	0
Cambodia	Public	Logistics	Port/Maritime	Channel, navigation and port improvements on Mekong, access to port at Siem Reap, development of intermodal terminal at Khone falls	274
Cambodia	Public	Logistics	Railway	Rail link: Snoul — Stung Treng (273 km)	275

Cambodia	Public	Logistics	Road/Bridge	Rehabilitation of national road No.64: Kg.Thom — Prehvihear	24
Cambodia	Public	Logistics	Road/Bridge	Rehabilitation of bridges along national road No.64	18
Cambodia	Public	Logistics	Road/Bridge	Rural investment and local governance project: Phase II	80
Cambodia	Public	Logistics	Road/Bridge	National road No.3: Veal Rinh — Kampot — Kampong Trach	271
Cambodia	Public	Logistics	Road/Bridge	Road: Kampong Trach —Lork (Vietnam border)	4
Cambodia	Public	Logistics	Road/Bridge	Rehabilitation of national road No.74	7
Cambodia	Public	Logistics	Road/Bridge	Improvement of national road No.78: Banlung — Oyadav	28
Cambodia	Public	Logistics	Road/Bridge	Rehabilitation of national road No.76a (160km): Banlong triangle border point (C—L—VN)	24
Cambodia	Public	Logistics	Road/Bridge	Improvement of Siem Reap city roads	13
Cambodia	Public	Logistics	Road/Bridge	Emergency repair and maintenance of narional and provincial roads	200
Cambodia	Public	Logistics	Road/Bridge	Rehabilitation of national road No.76: Ksim — Senmorom — Vietnam border	31
Cambodia	Public	Logistics	Road/Bridge	Rehabilitation of six concrete bridges	1
Cambodia	Public	Logistics	Road/Bridge	Rehabilitation of National road No.68: Kralanh—Samrong—Osmach	20
Cambodia	Public	Logistics	Road/Bridge	Road construction: Prek Tamak —O Raing Ao	30
Cambodia	Public	Logistics	Road/Bridge	Rehabilitation of national road: Anlong Veng —Preah Vihear	25
Cambodia	Public	Logistics	Road/Bridge	Rehabilitation of national road No.73	18
Cambodia	Public	Logistics	Road/Bridge	Rehabilitation of national road No.33 (56km)	10
Cambodia	Public	Logistics	Road/Bridge	Rehabilitation of national road No.66 (275km)	70
Cambodia	Public	Logistics	Road/Bridge	Construction of national road No.76b	2
Cambodia	Public	Logistics	Road/Bridge	Construction of national road No.11 (91km)	
Cambodia	Public	Other Economics	Industrial Estate/SEZ	Seafood processing park in Sihanoukville	10
Cambodia	Public	Urban and Social	Water Supply/Sanitation	Rehabilitation of Siem Reap stream	14
Cambodia	Public	Urban and Social	Water Supply/Sanitation	Repair dikes in Kampong Cham	20
Cambodia	Public	Urban and Social	Water Supply/Sanitation	Rehabitation of irrigation and control flood of Prek Thnot river	101

Cambodia	Public	Urban and Social	Water Supply/Sanitation	Project for flood prevention dam by Mekong river	11
Cambodia	Public	Urban and Social	Water Supply/Sanitation	Rehabilitation of irrigation system and control flood of Mekong river	31
Cambodia	Public	Urban and Social	Water Supply/Sanitation	Develop irrigation and control flood of Pausat river	101
Cambodia	Public	Urban and Social	Water Supply/Sanitation	Provincial capital water supply improvement project: Phase II	19
Cambodia	Public	Urban and Social	Water Supply/Sanitation	Four towns water supply development project in northwest border	16
Cambodia	Public	Urban and Social	Water Supply/Sanitation	Improvement of potable water supply in Prey Veng	279
Cambodia, Laos	Public	Logistics	Road/Bridge	National road 13S (Laos) and national road No.7 (Cambodia): Cross—border section	271
China	Public	Logistics	Airport	Manshi airport upgrading	15
China	Public	Logistics	Airport	Proposed feeder airport expansion project at Dali and Lijiang	45
China	Public	Logistics	Road/Bridge	Expressway: Baise — Debao — Longbang — Viet Nam Border	271
China	Public	Logistics	Road/Bridge	Expressway: Qinzhou —Chongzuo	271
China	Public	Logistics	Road/Bridge	Road upgrading: Chongzuo —Longzhou	271
China	Public	Logistics	Road/Bridge	Expressway: Chongzuo — Napo — Funing	271
India	Public	Logistics	Railway	Railway sector improvement project	
India	Public	Urban and Social	Multi	Karnataka urban infrastucture developoment	
India	Public	Urban and Social	Water Supply/Sanitation	Tami Nadu water supply project	
India	Public	Urban and Social	Water Supply/Sanitation	Karnataka water supply and sanitation Projects	
Laos	Public	Logistics	Airport	Northern airports improvement	1
Laos	Public	Logistics	Airport	Wattay international airport improvement	272
Laos	Public	Logistics	Airport	Upgrading of Pakse, Savannakhet and Luang Prabang airports	272
Laos	Public	Logistics	Airport	Construction of Luang Namtha airport	272

Laos	Public	Logistics	Port/Maritime	Development of Mekong river ports between Vientiane and Savannakhet	274
Laos	Public	Logistics	Railway	Railway between the Friendship Bridge to Kham Sa Vat village (14 km)	275
Laos	Public	Logistics	Railway	Rail link: From Thakhek to Kiumuya	275
Laos	Public	Logistics	Railway	SKRL spur line (L): Vientiane — Thakek — Mu Gia (466km)	
Laos	Private	Logistics	Road/Bridge	Improvement of roads in the southern region	64
Laos	Public	Logistics	Road/Bridge	Hongsa —Luangprabang Route	271
Laos	Public	Logistics	Road/Bridge	National road No.2: Houay Goan — Maung Ngeum — Pakbeng	20
Laos	Public	Logistics	Road/Bridge	National road No.4 / Highway 1268: New link Pak Lay —Thai border	271
Laos	Public	Logistics	Road/Bridge	National road No.1J: Attapeu —Cambodian border	271
Laos	Public	Logistics	Road/Bridge	National road No.14A: Junction national road No.16 — Lao PDR/Cambodian border	33
Laos	Public	Logistics	Road/Bridge	National road No.14B: Junction national road No.16 — Cambodian border (149km), proposed for paving/ reconstruction.	271
Laos	Public	Logistics	Road/Bridge	Pakse — Xekong direct route paving/reconstruction	34
Laos	Public	Logistics	Road/Bridge	The Khaek — Ngom Ma Lad road section (55km)	16
Laos	Public	Logistics	Road/Bridge	North —South road to Bokeo, Luang Namtha; some sections	271
Laos	Public	Logistics	Road/Bridge	Roads to provinces within the Lao—Vietnam—Cambodia economic triangle (Attapeu, Sekong and Saravane)	271
Laos	Public	Logistics	Road/Bridge	Roads to the provinces within Lao—Thailand—Cambodia Economic Triangle (Saravane and Champasak).	271
Laos	Public	Logistics	Road/Bridge	Highway route No.3	271
Laos	Public	Logistics	Road/Bridge	Extension of national roads No.16, 14A, 14B, 15; and 1J	271
Laos	Public	Logistics	Road/Bridge	Laobong to Saravane and from Saravane to Lao—Vietnam borders	271
Laos	Public	Logistics	Road/Bridge	National road No.16 from Sekong to Vietnam border	271
Laos	Public	Logistics	Road/Bridge	National road No.1B from Ban Muang to national road No.2 to Phongsaly	271
Laos	Public	Logistics	Road/Bridge	National road No.14 in Xaysomboun (13 km) and from Xayaboury to Paklai	271
Laos	Public	Logistics	Road/Bridge	National road No.1D connecting Attapeu to Northern parts of Cambodia	271
Laos	Public	Logistics	Road/Bridge	National road No.4A connecting the central part of Xayaboury to Luang Prabang and to the Mekong River	271
Laos	Public	Logistics	Road/Bridge	Bridge connecting Luang Prabang and Xiengman	271

Laos	Public	Logistics	Road/Bridge	Improvement of national road No.3207 (39km): Samtal ─Bantao, Vietnam Border, Houaphan Province	271
Laos	Public	Logistics	Road/Bridge	Improvement of national road No.3207 (107km): Phouthipheng ─ Pak oum ─ Naxoneo, Louangprabang Province	271
Laos	Public	Logistics	Road/Bridge	Improvement of national road No.14B (126km): Angkham ─ Nondang ─ Nonggna ─ Border of Lao, Thai, Chaodal, Champasak Province	271
Laos	Public	Logistics	Road/Bridge	Improvement of national road No.1D, 1E, 1F, 1G (687km): Thathom ─ Thasi ─ Laksao ─ Muangpin ─ Salavan	271
Laos	Public	Logistics	Road/Bridge	Improvement of national road No.1J (81km): Attapau─Chambodal, Attapau Province	271
Laos	Public	Logistics	Road/Bridge	Improvement of national road No.4A, 4B (167km): Muang gnem ─ Honsa ─ Louangphabang, Xalgnabull Province	271
Laos	Public	Logistics	Road/Bridge	Improvement of national road No.18A (118km): Patumphon ─ Attapeu, Champasak/Attapeu Province	271
Laos	Public	Logistics	Road/Bridge	Improvement of national road No.6A (71km): Paksong ─ BanKumKam, Champasak/Attapeu Province	271
Laos	Public	Logistics	Road/Bridge	Upgrade and asphalt concrete pavement of existing national road No.13N (70km): Vientiane Capital ─ Phonhong	271
Laos	Public	Logistics	Road/Bridge	Upgrade and Asphalt Concrete Pavement of Existing Road No.13S(60km): Vientiane Capital ─ Banhal	271
Laos	Public	Logistics	Road/Bridge	Upgrade and Asphalt Concrete Pavement of Existing Road No.10 (95.5km): Vientiane Capital ─ Ban Kem ─ Thalat ─ Phonhong	271
Laos	Public	Logistics	Road/Bridge	Upgradation of national road No.12	
Laos	Public	Logistics	Road/Bridge	Construction of national road No.16A	
Laos	Public	Logistics	Road/Bridge	Construction of Sekong bridge	105
Laos	Public	Logistics	Road/Bridge	Construction of Sedone bridge	105
Laos	Private	Other Economics	Energy/Power	Xe Katam hydroelectric power project for the export of electricity to Thailand	275
Laos	Public	Other Economics	Energy/Power	Rural electrification along national road No.9	5
Laos	Public	Other Economics	Energy/Power	Nam Ngum 1 hydropower station expansion	700

Laos	Public	Other Economics	Industrial Estate/SEZ	Agro—forestry SEZ in Thakek	5
Laos	Public	Other Economics	Industrial Estate/SEZ	Luang Namtha Development Industrial Zone (200 ha)	301
Laos	Public	Other Economics	Industrial Estate/SEZ	Economic and service centres in Luang Prabang	301
Myanmar	Public	Logistics	Railway	SKRL missing link: Thanbyuzayat — Three Pagoda Pass (110km)	
Myanmar, Thailand	Public	Logistics	Road/Bridge	Prachuap Port, Bang Saphan—Bokpyin new link	271
Thailand	Public	Logistics	Railway	SKRL missing link: Nam Tok — Three Pagoda Pass (153km)	
Thailand	Public	Other Economics	Energy/Power	Small scale biomass project by utilizing woody waste	300
Vietnam	Private	Logistics	Airport	Construction of DuongTo international airport, Phu Quoc	156
Vietnam	Private	Logistics	Airport	Van Don international airport improvement	210
Vietnam	Public	Logistics	Port/Maritime	Floating port on Hamluong river	274
Vietnam	Private	Logistics	Railway	Railway Improvement: Da Lat — Thap Cham	320
Vietnam	Private	Logistics	Railway	Railway: Bao Lam — Phan Thiet	500
Vietnam	Private	Logistics	Railway	Railway for aluminum mining and manufacturing in the west plateau	100
Vietnam	Public	Logistics	Railway	SKRL spur line (V): Mu Gia — Tan Ap — Vung Anh (119km)	
Vietnam	Private	Logistics	Road/Bridge	National road No.14 Improvement: Gia Lai — Kon Tum	58
Vietnam	Public	Other Economics	Energy/Power	Rural energy II: Additional financing	251
Vietnam	Public	Other Economics	Energy/Power	Hoa Binh hydro power plant extension project	

Table A1-2-1a. Prospective projects in BIMP+ sub-region (Tier 1): Top priority

Country	Type	Sector	Sub-Sector	Project Name	Cost
Indonesia	Private	Logistics	Port/Maritime	Greater Surabaya metropolitan ports	1,714

Indonesia	Private	Logistics	Port/Maritime	Jakarta 2nd port development	2,000
Indonesia	Public	Logistics	Port/Maritime	Tanjung Perak Port: Development of new terminal and access road	
Indonesia	Private	Logistics	Railway	Railway connecting Soekarno Hatta Airport and Manggarai (Central Jakarta)	700
Indonesia	Private	Logistics	Railway	Surabaya MRT construction project	2,500
Indonesia	Public	Logistics	Road	Jakarta MRT: North—South line extension	4,000
Indonesia	Public	Logistics	Road	Jakarta MRT: Other lines	7,000
Indonesia	Public	Logistics	Road/Bridge	Intelligent Traffic System in Jabodetabek	51
Indonesia	Public	Logistics	Road/Bridge	Improvement of transport information system in Jakarta	688
Indonesia	Private	Other Economics	Energy/Power	Central Java coal fired steam power plant (up to 2,000 MW)	2,000
Indonesia	Public	Other Economics	Energy/Power	Indramayu coal—fired power plant	3,000
Indonesia	Public	Other Economics	Energy/Power	Upper Cisokan pumped storage power plant	550
Indonesia	Public	Other Economics	Energy/Power	Java-Bali submarine cable (150 kV): Circuit 3 & 4	62
Indonesia	Public	Other Economics	Energy/Power	Muara Tawar add on blocks 2, 3, 4 combined cycle power plant (825 - 1,200 MW)	1,000
Indonesia	Public	Other Economics	Energy/Power	Rehabilitation and modernization of Paiton small power producer (SPP) 1&2 (2x400MW)	48
Indonesia	Public	Other Economics	Energy/Power	Upper Cisokan pumped storage hydro electric power plant (1,000 MW)	73
Indonesia	Public	Other Economics	Energy/Power	Nuclear power plant	20,000
Indonesia	Private	Urban and Social	Water Supply/Sanitation	Water supply/sanitation in DKI Jakarta — Bekasi — Karawang	377
Indonesia	Private	Urban and Social	Water Supply/Sanitation	Water supply/sanitation in west Cikarang & Cibitung Bekasi regency	28
Indonesia	Public	Urban and Social	Water Supply/Sanitation	GPOBA W3: Expanding piped water supply to urban poor in Sutabaya	4

Malaysia	Private	Other Economics	Energy/Power	Bakun submarine transmission cables	5,000
Philippines	Public	Logistics	Airport	Upgrading of Clark (Diosdado Macapagal) international airport	272
Philippines	Public	Logistics	Port/Maritime	World—Class Subic international Seaport	274
Philippines	Public	Logistics	Port/Maritime	Manila Port: Expansion of container terminals	
Philippines	Public	Logistics	Port/Maritime	Cebu Port: Development of new Cebu port	
Philippines	Public	Logistics	Railways	Manila LRT: 2nd line extention	1,500
Philippines	Public	Logistics	Road	Central Ruzon Highway & Japan−Philippines Friendship Road Connection Project	1,000
Philippines	Public	Logistics	Road	Arterial highway bypass construction project (ii)	700
Philippines	Private	Logistics	Road/Bridge	The CALA East—West national road project	106
Philippines	Private	Logistics	Road/Bridge	Metro Manila C6 Expressway	271
Philippines	Private	Logistics	Road/Bridge	Clark Dryport construction project	271
Philippines	Private	Logistics	Road/Bridge	NAIA Expressway and MIAA's international cargo terminal	240
Philippines	Public	Logistics	Road/Bridge	Improvement of existing bridges along Pasig River and Marikina River (near Manila)	5
Philippines	Public	Logistics	Road/Bridge	Manila LRT: 1st line south extension	682
Philippines	Public	Logistics	Road/Bridge	North − South highway: Cavite − Laguna	180

Table A1-2-1b. Prospective projects in BIMP+ sub-region (Tier 1): Priority

Country	Type	Sector	Sub-Sector	Project Name	Cost
Indonesia	Public	Logistics	Airport	Jakarta 3rd airport development project	
Indonesia	Private	Logistics	Railway	Java high speed railway Construction project	275
Indonesia	Private	Logistics	Road/Bridge	Arterial road system development in gerbang kertosusila region, Surabaya metropolitan area	688
Indonesia	Private	Logistics	Road/Bridge	The improvement of access road to Soekarno—Hatta Airport	271
Indonesia	Public	Logistics	Road/Bridge	Enggano interchange costruction project	10
Indonesia	Private	Other Economics	Energy/Power	Repowering of thermal power plants in Java —Bali region	275

Indonesia	Private	Other Economics	Energy/Power	Upgrading transmission capacity of existing 500kV Llnes in west Java	275
Indonesia	Private	Other Economics	Energy/Power	Construction of a new power plant which will supply electricity to the designated industrial customers of the industrial park	275
Indonesia	Private	Other Economics	Energy/Power	Private power project at Bukit Indah Industrial Park	275
Indonesia	Public	Other Economics	Energy/Power	Rehabilitation and modernization of Saguling hydro electric power plant (178 MW x 4)	16
Indonesia	Public	Other Economics	Energy/Power	500 kV Java Bali crossing	328
Indonesia	Public	Other Economics	Energy/Power	Java －Bali electricity distribution performance improvement	115
Indonesia	Public	Other Economics	Energy/Power	Suralaya coal thermal power plant rehabilitation and improvement project	72
Indonesia	Public	Other Economics	Energy/Power	Tanjung Perak power plant repowering project	186
Indonesia	Public	Other Economics	Energy/Power	Eastern Indonesia geothermal power plant project	1,500
Indonesia	Public	Other Economics	Energy/Power	Fulu Lais geothermal power plant project	
Indonesia	Public	Other Economics	Energy/Power	Merangin hydropower generation plant project	3,500
Indonesia	Public	Other Economics	Energy/Power	Bakaru hydropower generation plant project	3,000
Indonesia	Private	Other Economics	Telecommunication	Enhancement of ICT infrastructure in Java	266
Indonesia	Public	Urban and Social	Water Supply/Sanitation	Umbulan water supply project (engineering service)	50
Philippines	Public	Logistics	Road/Bridge	Final Linkage of the MRT/LRT commuter loop	271
Philippines	Private	Other Economics	Energy/Power	Masinloc coal －fired thermal power plant expansion project	275

Table A1-2-1c. Prospective projects in BIMP+ sub-region (Tier 1): Normal

Country	Type	Sector	Sub-Sector	Project Name	Cost
Indonesia	Public	Logistics	Railway	Jakarta － Bandung doubleing track, electrification project	275
Indonesia	Private	Logistics	Road/Bridge	Public−private−partnership scheme for trans Java toll road	1,800
Indonesia	Private	Other Economics	Energy/Power	East Java sea water pumped storage power project	275
Indonesia	Public	Other Economics	Energy/Power	Java - Bali transmission line construction project	320
Philippines	Public	Other Economics	Energy/Power	Bataan LNG receiving terminal and gas firing power station project	275
Philippines	Public	Urban and Social	Water Supply/Sanitation	Flood control in the Clark—Subic area	279

Table A1-2-2a. Prospective projects in BIMP+ sub-region (Tier 2): Top priority

Country	Type	Sector	Sub-Sector	Project Name	Cost
Brunei	Public	Logistics	Port/Maritime	Muara port: Development of container terminal	
Indonesia	Public	Logistics	Port/Maritime	Port development in eastern Indonesian region	
Indonesia	Public	Logistics	Port/Maritime	Tanjung Emas port: Development of deep water terminal	
Indonesia	Public	Logistics	Port/Maritime	Makassar port: Development of container terminal	
Indonesia	Private	Other Economics	Energy/Power	Sarulla geothermal power plant	1,000
Philippines	Public	Logistics	Airport	The strategy for the improvement of national airports	305
Philippines	Public	Logistics	Port/Maritime	Port develpoment in southern Philippine region	
Philippines	Public	Logistics	Road	Road improvement and maintenance project	4,080
Philippines	Private	Logistics	Road/Bridge	Bypass: Palo	6

Philippines	Public	Logistics	Road/Bridge	Bypass: General Santos City	14
Philippines	Public	Logistics	Road/Bridge	Bypass: Korondal City	10
Philippines	Public	Logistics	Road/Bridge	Bypass: Tuguegarao City	6
Philippines	Public	Logistics	Port/Maritime	Enhancement of port security	
Philippines	Public	Logistics	Port/Maritime	Improvement of port maintenance	
Philippines	Public	Logistics	Port/Maritime	Improvement of port related procedure	
Philippines	Public	Logistics	Port/Maritime	Improvement of port management and operation	

Table A1-2-2b. Prospective projects in BIMP+ sub-region (Tier 2): Priority

Country	Type	Sector	Sub-Sector	Project Name	Cost
Indonesia	Public	Logistics	Port/Maritime	Vessel traffic services (VTS) system: Phase II	26
Indonesia	Public	Logistics	Port/Maritime	Inner coast shipping transportation project	2,000
Indonesia	Public	Logistics	Road	Bandung inner city highway development project	1,380
Indonesia	Private	Logistics	Road/Bridge	Toll road connecting Cileunyi (near Bandung) — Sumedang — Dawuan (to central Java)	395
Indonesia	Private	Logistics	Road/Bridge	Sukabumi — Ciranjang Toll Road	186
Indonesia	Private	Urban and Social	Water Supply/Sanitation	Water supply/sanitation in Bandung Municipality (Cimenteng)	54
Indonesia	Private	Urban and Social	Water Supply/Sanitation	Water supply/sanitation in Indramayu regency	1
Indonesia	Private	Urban and Social	Water Supply/Sanitation	Water supply/sanitation in Cirebon	14
Indonesia	Private	Urban and Social	Water Supply/Sanitation	Integrated solid waste final disposal and treatment facility for Bogor and Depok Area — West Java (Nmbo)	40
Philippines	Public	Logistics	Airport	Tourism infrastructure: Airports component	272
Philippines	Public	Logistics	Port/Maritime	Tourism infrastructure: Ports component	274
Philippines	Public	Logistics	Port/Maritime	Western Nautical Highway	274

Philippines	Public	Logistics	Port/Maritime	Central Nautical Highway	274
Philippines	Public	Logistics	Port/Maritime	Eastern Nautical Highway	274
Philippines	Public	Logistics	Port/Maritime	Cebu integrated port development plan	437
Philippines	Public	Logistics	Road/Bridge	Digos city west bypass (6 Km)	4
Philippines	Public	Logistics	Road/Bridge	Bypass: Tagum City	17
Philippines	Public	Logistics	Road/Bridge	Tourism infrastructure: Roads component	271
Philippines	Public	Other Economics	Energy/Power	Chiller energy efficiency project	54

Table A1-2-2c. Prospective projects in BIMP+ sub-region (Tier 2): Normal

Country	Type	Sector	Sub-Sector	Project Name	Cost
Indonesia	Public	Logistics	Airport	Airport rescue and firefighting equipment development project	20
Indonesia	Public	Logistics	Airport	Airport maintenance and equipment development project	31
Indonesia	Public	Logistics	Port/Maritime	Indonesia patrol improvement project	47
Indonesia	Public	Logistics	Port/Maritime	Maritime traffic safety system development plan	552
Indonesia	Private	Logistics	Railway	Development of regional railway system of central Java region	1,826
Indonesia	Public	Logistics	Road	Trans—Java highway development project	
Indonesia	Private	Logistics	Road/Bridge	Toll road: Pasir Koja — Soreang	102
Indonesia	Private	Logistics	Road/Bridge	Construction of ring toll road in north Sumarang	271
Indonesia	Public	Logistics	Road/Bridge	Toll road: Solo - Kertosono (Stage Colomadu - Karanganyar and Stage Saradon - Kertosono)	110
Indonesia	Public	Logistics	Road/Bridge	Semplak bypass	6
Indonesia	Public	Logistics	Road/Bridge	Kalibanteng traffic improvement project	5
Indonesia	Public	Logistics	Road/Bridge	Road links development and bridges reconstruction project	166
Indonesia	Public	Other Economics	Energy/Power	Scattered transmission and sub-station in Indonesia	500

Indonesia	Public	Other Economics	Energy/Power	Biomass power plant project	57
Indonesia	Public	Other Economics	Energy/Power	Kamojang geothermal power plant enhancement project	10
Indonesia	Private	Urban and Social	Water Supply/Sanitation	Water supply/sanitation in Bandung regency	17
Indonesia	Private	Urban and Social	Water Supply/Sanitation	Water supply/sanitation in Sumedang regency	5
Indonesia	Private	Urban and Social	Water Supply/Sanitation	Integrated solid waste final disposal and treatment facility for greater Bandung area	80
Philippines	Private	Logistics	Road/Bridge	Panguil Bay bridge	0
Philippines	Public	Logistics	Road/Bridge	Bypass: Cotabato city	11
Philippines	Public	Logistics	Road/Bridge	Bypass: Daraga (14.58km)	1
Philippines	Public	Logistics	Road/Bridge	Bypass: Panabo city	6
Philippines	Public	Logistics	Road/Bridge	Bypass: Santiago city	3
Philippines	Public	Logistics	Road/Bridge	Sipocot － Putiao diversion road	78

Table A1-2-3b. Prospective projects in BIMP+ sub-region (Tier 3): Priority

Country	Type	Sector	Sub-Sector	Project Name	Cost
Indonesia	Private	Logistics	Port/Maritime	Tanah Ampo cruise terminal, Karangasem (Bali)	24
Indonesia	Public	Logistics	Port/Maritime	Pontianak port: Dredging channel, renewal of quay cranes, expansion of terminal	
Indonesia	Public	Logistics	Port/Maritime	Balikpapan port: Development of new container terminal	
Indonesia	Public	Logistics	Port/Maritime	Bitung port: Expansion of terminal	
Indonesia	Public	Logistics	Port/Maritime	Jayapura port: Extension of mult-purpose terminal	
Indonesia	Public	Logistics	Port/Maritime	Sorong port: Expansion of container terminal	
Indonesia	Public	Logistics	Port/Maritime	Banjarmasin port: Development of a master plan on utilization in port area	
Indonesia	Public	Urban and Social	Water Supply/Sanitation	Improvement of water supply systems of Maros and Takalar	25

Malaysia	Public	Logistics	Port/Maritime	Bintulu port: Expansion of container terminal	
Malaysia	Public	Logistics	Port/Maritime	Sandakan port: Development of berthing facilities for berges	
Philippines	Public	Logistics	Port/Maritime	Iloilo port: Installation of quay cranes	
Philippines	Public	Logistics	Port/Maritime	Cagayan de Oro port: Development of ramp for RORO ships	
Philippines	Public	Logistics	Port/Maritime	Davao port: Development of quay crane and expansion of container terminal	
Philippines	Public	Logistics	Port/Maritime	General Santos port: Installation of quay cranes	
Philippines	Public	Logistics	Port/Maritime	Zamboanga port: Development of international passenger terminal	

Table A1-2-3c. Prospective projects in BIMP+ sub-region (Tier 3): Normal

Country	Type	Sector	Sub-Sector	Project Name	Cost
Brunei, Malaysia, Indonesia	Public	Logistics	Road/Bridge	Borneo Economic Corridor: Bandar Sri Begawan — Kuching — Pontianak (940km)	
Indonesia	Public	Logistics	Port/Maritime	Ferry operations in Sulawesi island	274
Indonesia	Public	Logistics	Port/Maritime	Maintenance dredging in the access channel of Banjarmasin port	51
Indonesia	Private	Logistics	Railway	Coal railway connecting Palaci and Bangkuang (coal mine to river port)	740
Indonesia	Private	Logistics	Road/Bridge	Pandaan — Malang toll road	253
Indonesia	Private	Logistics	Road/Bridge	Serangan — Tanjung Benoa toll road	149
Indonesia	Private	Logistics	Road/Bridge	Manado — Bitung toll road	561
Indonesia	Private	Logistics	Road/Bridge	Arterial road network development plan for Sulawesi Island and feasibility study on priority arterial roads in South Sulawesi province	766
Indonesia	Public	Logistics	Road/Bridge	Upgradation and maintainance of Trans Slawesi road (Priority 1): Jeneponto — Makassar — Parepare (658km)	274
Indonesia	Public	Logistics	Road/Bridge	Upgradation and maintainance of Trans Slawesi road (Priority 10): Toboli — Gorontalo (973km)	179
Indonesia	Public	Logistics	Road/Bridge	Upgradation and maintainance of Trans Slawesi road (Priority 11): Kolaka — Kendari (312km)	44

Indonesia	Public	Logistics	Road/Bridge	Upgradation and maintainance of Trans Slawesi road (Priority 12): Mamuju — Palu (387km)	89
Indonesia	Public	Logistics	Road/Bridge	Upgradation and maintainance of Trans Slawesi road (Priority 13): Tondoyondo — Luwuk — Poso (1235km)	71
Indonesia	Public	Logistics	Road/Bridge	Upgradation and maintainance of Trans Slawesi road (Priority 14): Molibagu — Worotical (184km)	33
Indonesia	Public	Logistics	Road/Bridge	Upgradation and maintainance of Trans Slawesi road (Priority 15): Wotu — Kolaka (435km)	97
Indonesia	Public	Logistics	Road/Bridge	Upgradation and maintainance of Trans Slawesi road (Priority 16): Kendari — Tondoyondo (373km)	55
Indonesia	Public	Logistics	Road/Bridge	Upgradation and maintainance of Trans Slawesi road (Priority 17): Wotu — Poso — Toboli (1069km)	135
Indonesia	Public	Logistics	Road/Bridge	Upgradation and maintainance of Trans Slawesi road (Priority 18): Kolaka — Tinanggea — Kendari (1060km)	90
Indonesia	Public	Logistics	Road/Bridge	Upgradation and maintainance of Trans Slawesi road (Priority 19): Landawe — Tolala (150km)	66
Indonesia	Public	Logistics	Road/Bridge	Upgradation and maintainance of Trans Slawesi road (Priority 2): Jeneponto — Watanpone — Wotu (1452km)	189
Indonesia	Public	Logistics	Road/Bridge	Upgradation and maintainance of Trans Slawesi road (Priority 3): Wonomulyo — Kaluku (200km)	37
Indonesia	Public	Logistics	Road/Bridge	Upgradation and maintainance of Trans Slawesi road (Priority 4): Parepare — Mamuju (692km)	111
Indonesia	Public	Logistics	Road/Bridge	Upgradation and maintainance of Trans Slawesi road (Priority 5): Maros — Bajoe (144km)	16
Indonesia	Public	Logistics	Road/Bridge	Upgradation and maintainance of Trans Slawesi road (Priority 6): Parepare — Paiopo (290km)	41
Indonesia	Public	Logistics	Road/Bridge	Upgradation and maintainance of Trans Slawesi road (Priority 7): Palu — Kwandang (1019km)	47
Indonesia	Public	Logistics	Road/Bridge	Upgradation and maintainance of Trans Slawesi road (Priority 8): Kuwandang — Manado — Bitung (1399km)	211
Indonesia	Public	Logistics	Road/Bridge	Upgradation and maintainance of Trans Slawesi road (Priority 9): Gorontalo — Bitung (893km)	105

Indonesia	Public	Logistics	Road/Bridge	Construction of Serangan - Tanjung Benoa bridge	140
Indonesia	Public	Logistics	Road/Bridge	Tayan bridge construction	96
Indonesia	Public	Logistics	Road/Bridge	Construction of Kendari bridge	66
Indonesia	Public	Logistics	Road/Bridge	Gorontalo - Djalaludin airport road construction project	20
Indonesia	Public	Logistics	Road/Bridge	Improvement of Perintis —Urip road	40
Indonesia	Public	Logistics	Road/Bridge	Mahkota Second bridge construction project	27
Indonesia	Public	Logistics	Road/Bridge	Rantauan Keliling Ilir bridge project	3
Indonesia	Public	Other Economics	Energy/Power	Bio—diesel fuel production in Sulawesi	300
Indonesia	Public	Other Economics	Energy/Power	Lahendong geothermal project	29
Indonesia	Public	Other Economics	Energy/Power	Expansion of Lahendong unit 5 & 6 (2x20 MW)	108
Indonesia	Public	Other Economics	Energy/Power	Lahendong IV GEOPP (1x20 MW)	39
Indonesia	Public	Other Economics	Energy/Power	Sembalun GEOPP, Lombok (2x10 MW)	48
Indonesia	Public	Other Economics	Energy/Power	Lombok Steam coal power plant (2x25MW)	83
Indonesia	Public	Other Economics	Energy/Power	Parit Baru steam power plant (2x50 MW)	156
Indonesia	Public	Other Economics	Energy/Power	Takalar Steam coal power plant (2x115 MW) in South Sulawesi	421
Indonesia	Public	Other Economics	Energy/Power	Substation expansion and distribution system rehabilitation	12
Indonesia	Public	Other Economics	Energy/Power	Asam Asam coal thermal power plant construction project	130
Indonesia	Public	Other Economics	Energy/Power	Marea hydropower plant construction project	220
Indonesia	Public	Other Economics	Energy/Power	Bonto Batu hydropower plant construction project	120

Indonesia	Public	Urban and Social	Energy/Power	Makassar — TPA Tamangapa landfill methane collection and flaring	8
Indonesia	Public	Urban and Social	Water Supply/Sanitation	Construction of dams (Raknamo, Temef) for water resources development in NTT Province	90
Indonesia	Public	Other Economics	Energy/Power	Pontianak — LFG recovery project	4
Indonesia/Timor−Leste	Public	Logistics	Road	Kupang—Dili road	2,000
Philippines	Public	Urban and Social	Water Supply/Sanitation	Tarlac river improvement project, 2006—2010	279
Philippines	Public	Urban and Social	Water Supply/Sanitation	Pampanga river basin watershed management plan	279
Timor−Leste	Public	Logistics	Port/Maritime	Deep seaport development	2,000

Table A1-3-1a. Prospective projects in IMT+ sub-region (Tier 1): Top priority

Country	Type	Sector	Sub-Sector	Project Name	Cost
Malaysia	Public	Logistics	Airport	KLIA capacity enhancement	272

Table A1-3-1b. Prospective projects in IMT+ sub-region (Tier 1): Priority

Country	Type	Sector	Sub-Sector	Project Name	Cost
Indonesia	Public	Logistics	Railway	Melak Line Tanah Abang — Serpong railway double tracking project	115
Malaysia	Public	Logistics	Railway	Expansion of LRT in Kuala Lumpur	275
Malaysia	Private	Other Economics	Energy/Power	Pulau Carey coal fired power station in Selangor	275
Malaysia	Public	Other Economics	Energy/Power	New transmission lines for the Central area reinforcement in Klang Valley	275

Table A1-3-1c. Prospective projects in IMT+ sub-region (Tier 1): Normal

Country	Type	Sector	Sub-Sector	Project Name	Cost
Malaysia	Public	Urban and Social	Water Supply/Sanitation	Inter—state raw water transfer project from Pahang to Selangor (Pahang—Selangor ISRWT)	279

Table A1-3-2a. Prospective projects in IMT+ sub-region (Tier 2): Top priority

Country	Type	Sector	Sub-Sector	Project Name	Cost
Indonesia	Private	Logistics	Port/Maritime	Dumai port development	1,000
Indonesia	Public	Logistics	Port/Maritime	Belawan port (Medan) Expansion	13
Indonesia	Public	Logistics	Port/Maritime	Enhancement of port security	
Indonesia	Public	Logistics	Port/Maritime	Improvement of port maintenance	
Indonesia	Public	Logistics	Port/Maritime	Improvement of port related procedure	
Indonesia	Public	Logistics	Port/Maritime	Improvement of port management and operation	
Indonesia	Private	Logistics	Road/Bridge	Toll road: Medan — Binjai	129
Indonesia	Private	Logistics	Road/Bridge	Toll road: Medan — Kualanamu — Tebing Tinggi	476
Indonesia	Private	Logistics	Road/Bridge	Toll road: Pekanbaru — Kandis — Dumai	845
Thailand	Private	Logistics	Port/Maritime	Development of Andaman Sea gate port	274
Thailand	Private	Logistics	Port/Maritime	Greenfield development of Naklua port	25
Thailand	Public	Logistics	Port/Maritime	Phuket port improvement.	3
Thailand	Public	Logistics	Port/Maritime	Construction of new cargo port at Pakbara	310

Table A1-3-2b. Prospective projects in IMT+ sub-region (Tier 2): Priority

Country	Type	Sector	Sub-Sector	Project Name	Cost

Indonesia	Public	Logistics	Airport	New Medan airport construction project	225
Indonesia	Public	Logistics	Port/Maritime	Development of integrated security and safety system in Malaka Straits	5
Indonesia	Public	Logistics	Port/Maritime	Enhancement of vessel traffic system in Malacca and Singapore Straits in Indonesia: Stage 1	16
Indonesia	Private	Logistics	Road/Bridge	Toll road: Palembang ― Indralaya	105
Indonesia	Private	Logistics	Road/Bridge	Toll road: Tegineneng ― Babatan	273
Indonesia	Private	Logistics	Road/Bridge	Toll road: Bandar Lampung ― Bakahuni (100km)	82
Indonesia	Public	Logistics	Road/Bridge	Musi bridge III construction: Phase I	55
Indonesia	Public	Other Economics	Energy/Power	Construction of 500kvHVDC power transmission line between Malacca and Pekanbaru. (I)	700
Indonesia	Private	Urban and Social	Water Supply/Sanitation	Water supply/sanitation in Medan municipality	6
Indonesia	Private	Urban and Social	Water Supply/Sanitation	Water supply/sanitation in Bandar Lampung municipality	52
Malaysia	Public	Other Economics	Energy/Power	Construction of 501kvHVDC power transmission line between Malacca and Pekanbaru. (M)	500
Thailand	Private	Logistics	Road/Bridge	Toll Road in Sadao	300

Table A1-3-2c. Prospective projects in IMT+ sub-region (Tier 2): Normal

Country	Type	Sector	Sub-Sector	Project Name	Cost
Indonesia	Public	Logistics	Port/Maritime	Muara Desert river port development project	23
Indonesia	Private	Logistics	Railway	Railway transport capacity improvement project in South Sumatra	275
Indonesia	Private	Logistics	Railway	Pekanbaru―Dumai railway(East Sumatra Corridor)	
Indonesia	Public	Logistics	Road/Bridge	Padang Bypass capacity expansion	65
Indonesia	Public	Logistics	Road/Bridge	Kerok No.9 bridge construction project	36
Indonesia	Public	Other Economics	Energy/Power	Ulubelu unit 3 & 4 (2x55 MW)	295

Indonesia	Public	Other Economics	Energy/Power	Lumut Balai geothermal power plant project	242
Indonesia	Public	Other Economics	Energy/Power	Payakumbuth － Padang Sidempuan Northen─Western Sumatra cooporation project	50
Indonesia	Public	Urban and Social	Water Supply/Sanitation	Jambu Aye multipurpose reservoir project: Phase I	86
Indonesia	Public	Urban and Social	Water Supply/Sanitation	Medan Sewerage development project	100
Malaysia	Public	Logistics	Port/Maritime	Enhancement of the performance and productivity of ports	274
Malaysia	Public	Logistics	Railway	Track realignment and improvement works from Taiping to Padang Rengas	275
Malaysia	Public	Logistics	Railway	Rehabilitation and strengthening of tracks and bridges	275
Malaysia	Public	Logistics	Railway	Computerising the signalling systems	275
Malaysia	Public	Logistics	Railway	Construction of dedicated freight spur lines from industrial areas to major cities and ports.	275
Malaysia	Public	Logistics	Road/Bridge	Construction of ring roads and bypasses in Georgetown, Pulau Pinang; Seremban, Negeri Sembilan; and Johor Bahru, Johor	271
Malaysia	Public	Other Economics	Energy/Power	Peninsular Malaysia─Sumatera interconnection grid	275
Malaysia	Public	Other Economics	Energy/Power	Northern area reinforcement from Manjung in Perak to Pulau Pinang	275
Malaysia	Public	Other Economics	Energy/Power	South─Central reinforcement from Sepang to Puchong	275
Thailand	Public	Logistics	Railway	Surat Thani － Tanun (Phang Nga) (165 km)	275

Table A1-3-3b. Prospective projects in IMT+ sub-region (Tier 3): Priority

Country	Type	Sector	Sub-Sector	Project Name	Cost
Indonesia	Private	Logistics	Port/Maritime	Kuala Enok port (South of Dumai) improvement	15
Indonesia	Public	Logistics	Port/Maritime	Ulee Lheue port (Banda Aceh) improvement	1

Indonesia	Public	Logistics	Port/Maritime	Mafahayati port (Banda Ache) improvement	12
Indonesia	Public	Logistics	Port/Maritime	Palembang port: Dredging channel	
Indonesia	Public	Logistics	Port/Maritime	Panjang port: Developnment of general cargo teminal	
Malaysia	Public	Logistics	Port/Maritime	Kemaman port: Development of Multi-purpose terminal	
Thailand	Public	Logistics	Port/Maritime	Songhkla Port: Dredging Channel and Installation of Quay Crane	

Table A1-3-3c. Prospective projects in IMT+ sub-region (Tier 3): Normal

Country	Type	Sector	Sub-Sector	Project Name	Cost
Indonesia	Public	Logistics	Port/Maritime	The development scheme for the principal river ports	264
Malaysia	Public	Urban and Social	Water Supply/Sanitation	Water supply to Sabah, Sarawak, Pahang, Kelantan, Terengganu and Kedah states	279
Malaysia	Public	Urban and Social	Water Supply/Sanitation	Flood mitigation Works for Kota Bharu and other selected areas along Sungai Kelantan in Kelantan	279

Notes: 1) The second column "Type" indicates the likely sources of finance. "Private" means that the project can be implemented under public-private partnership (PPP). It does not mean the project should be implemented by the private sector alone.

2) Some of the costs indicated in the sixth column are the estimates based on similar projects in the list.

APPENDIX 2. ERIA PRE-F/S PILOT PROJECTS IN FY2009

In parallel with the CADP, ERIA conducted the Pre-F/S Pilot Project in 2009FY as an individual project commissioned by the Government of Japan. The purpose of the project is (i) to encourage and accelerate the implementation of infrastructure projects in East Asia by conducting pre-feasibility studies for selected projects, (ii) to promote public-private partnership (PPP) for infrastructure development in East Asia by providing model cases, and (iii) to provide useful inputs to the CADP.

Projects are selected primarily based on quality as pilot projects rather than reflecting already established priorities in development plans or the possibilities of immediate implementation. The study tries to fill a missing link in infrastructure development in terms of geographical coverage, their sectoral coverage, project design, and implementation scheme.

Below, section A provides a summary of the study on Indonesia Economic Development Corridors (IEDC). Section B presents brief summaries of other projects.

1. Indonesia Economic Development Corridors (IEDC)

1-1. Background

Economic Research Institute for ASEAN and East Asia (ERIA), with the support from the Coordinating Ministry for Economic Affairs in Indonesia (CMEA) and the Ministry of Economy, Trade and Industry Japan (METI), conducted a commissioned study on Indonesia Economic Development Corridors. This study was carried out in close collaboration with other key stakeholders including government officials from various ministries and academicians in Indonesia. We also referred to existing studies and plans as widely as possible, which include RTRWN[1] and a number ofthe World Bank reports

The following are four major outcomes of this study:

(1) Nomination and sequencing of Indonesia Economic Development Corridors (IEDCs)

[1] Rencana Tata Ruang Wilayah National (National Spatial Plan).

(2) Development of Master Plans for the first-phase IEDCs, and Concept Plans for the second-phase IEDCs
(3) Institutional and regulatory framework
(4) High priority infrastructure projects and feasibility studies on selected pilot projects

This document contains the summary of the study, focusing on the first-phase IEDCs.

1-2. Rationale, Nomination and Sequencing of IEDCs

1-2-1. IEDCs: definition, objectives, and guiding principles

We define IEDCs as areas for targeted policy, development initiatives, and infrastructure projects to create and empower an integrated and competitive economic base to achieve sustainable development. The IEDCs connect hubs (large cities with high population density and economic activity), industry nodes (sector-specific clusters of economic activity), and supporting infrastructure (airports, seaports, and power & water suppliers).

The objective of the IEDCs is to achieve sustainable and balanced economic growth and social development. This is achieved by enhancing the connectivity between leading and lagging regions and harnessing the amalgamation effects of this connectivity. IEDCs also provide an overarching structure to ensure cohesiveness and connectivity between special economic zones, free-trade zones, and other economic development areas.

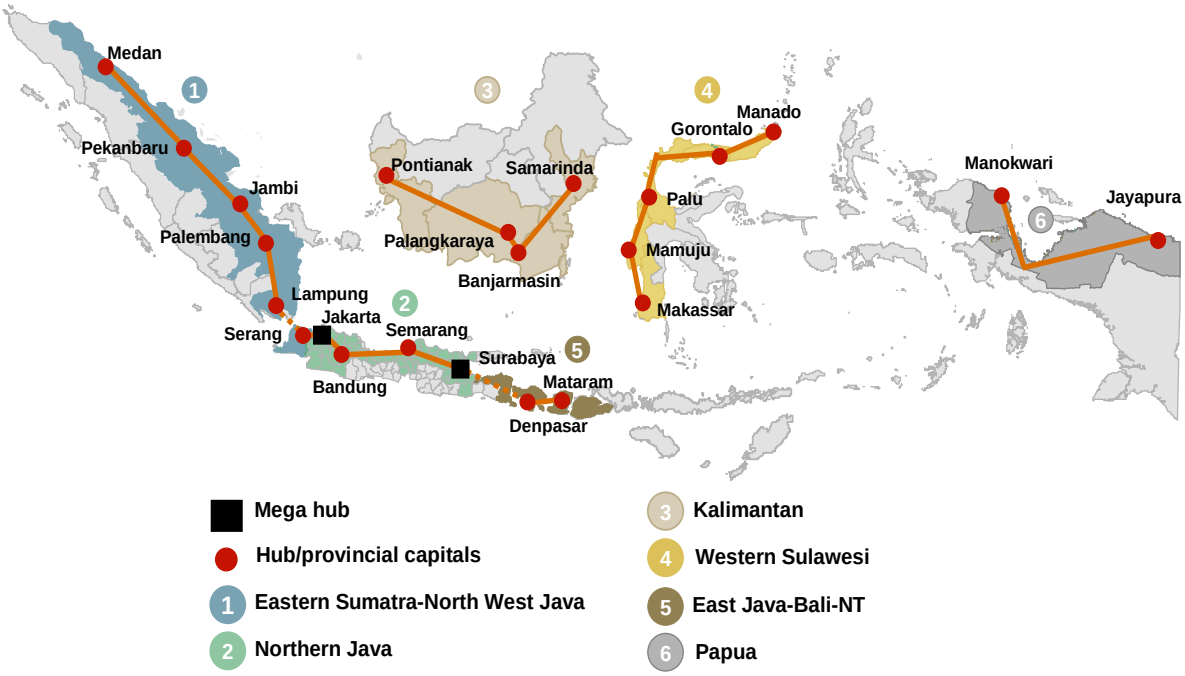
1-2-2. Nomination of IEDCs

The nomination of IEDCs is based on a comprehensive methodology starting from defining the key hubs of the corridor, the corridor path, connection to mega hubs, and the area of industry focus. Key principles for corridor nomination are used to guide this analysis, which are based on benchmarks from successful corridor development examples at the global level. This is followed by detailed analysis of potential corridors and consultations with key stakeholders to nominate the six IEDCs for Indonesia. Furthermore, existing studies and analysis on corridors are also leveraged.

The six nominated IEDCs are

- Eastern Sumatera-North Western Java
- Northern Java
- Kalimantan
- Western Sulawesi
- East Java – Bali – NTT
- Papua

Figure A2-1. Indonesia Economic Development Corridors (IEDCs)



1-2-3. Sequencing of IEDCs for implementation

The nominated IEDCs are then phased for implementation, based on analysis in two dimensions:

- Economic attractiveness and potential – increasing market size, GDP, number of hubs, availability of factors of production, and aligned with sectoralpriorities for Indonesia, but decreasing investment risk

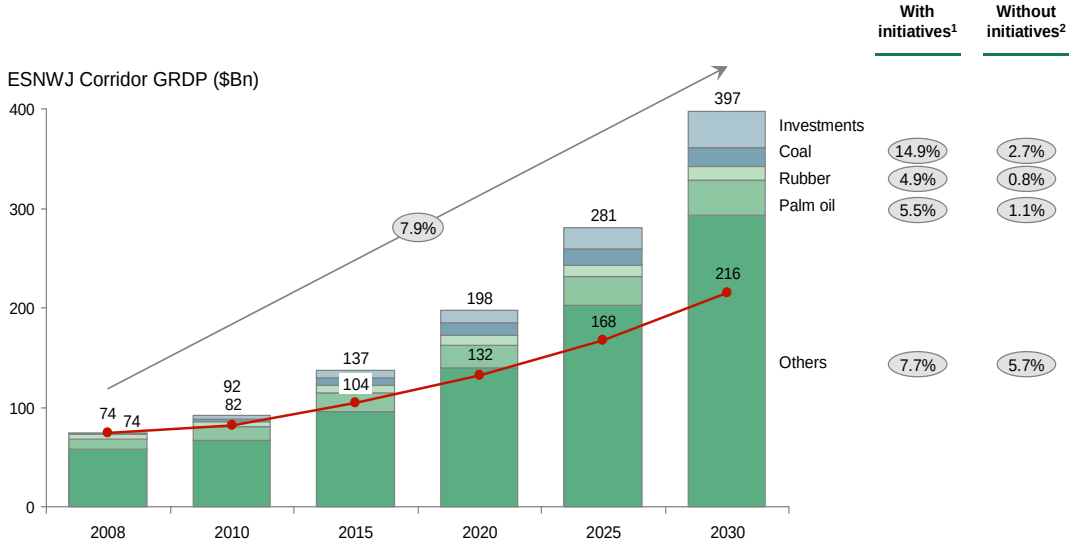
- Socio-economic attractiveness – increasingly narrowing disparity, rural population, consistency with existing government plans and environmental considerations, but decreasing existing infrastructure quality

All IEDCs are critical for the development of Indonesia. However, IEDCs with high economic attractiveness and potential as well as socio-economic attractiveness are prioritized for the first phase of implementation. The Eastern Sumatra-North West Java Corridor (ESNWJ) and Northern Java (NJ) Corridor are nominated for the first phase of implementation, Kalimantan and Western Sulawesi for the second phase, and East Java–Bali–NTT and Papua for the third phase.

1-2-4. Impact of IEDCs on the priority corridors

Based on recommendations for initiatives in the master plans, ESNWJ's GRDP is likely to increase by 5-6 times to $400Bn by 2030, growing at 8% per year. This would result in the creation of up to 25Mn additional jobs in the corridor. Similarly, NJ corridor's GRDP is likely to increase by 5-6 times to $1,020Bn by 2030, resulting in the creation of 33Mn new jobs from various corridor development initiatives.

Figure A2-2. Impact of ESNWJ Corridors



Beyond their economic impact, IEDCs will result in a significant uplift in quality of life of the people along the corridors. While some investments in infrastructure will directly improve quality of life, others will enable greater economic development,

provide employment, improve income levels, and thus benefit the people of the corridors.

In addition, the initiatives in the master plans will benefit the provinces and Kabupatens outside the corridors too, driven by three key reasons. Firstly, specific initiatives designed for regions within the corridors will have direct influence on Kabupatens outside the corridors too (e.g. the coal mining sector in South Sumatera). Secondly, a number of initiatives in the master plans are not location-specific (e.g. the palm oil board) and therefore will benefit neighbouring regions as well. Thirdly, improved connectivity will have a spillover effect to nearby areas, thus helping develop the economy of the region.

1-3. Summary of master plans and concept plans

For the two priority corridors (ESNWJ and NJ), detailed master plans are complete. In addition, concept plans have been developed for the next phase of IEDCs (Kalimantan and Western Sulawesi corridors). This section will provide a short summary of the master plans.

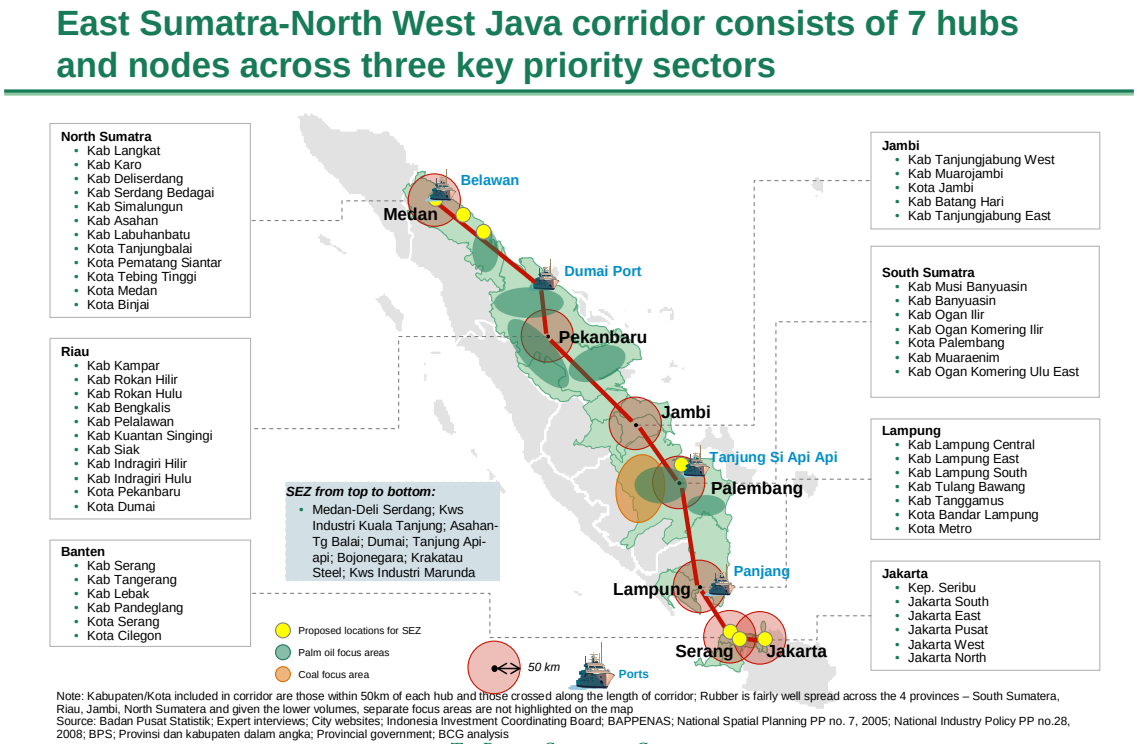
1-3-1. Eastern Sumatera North Western Java Corridor (ESNWJ)

The ESNWJ connects the key hubs of Medan and Jakarta, and 5 other hubs in between them: Pekanbaru, Jambi, Palembang, Lampung, and Serang. It helps to connect rural areas between the hubs, allowing for spillover benefits through improved access to the hubs. A link to the mega-hub Jakarta is made in order to help gain access to its resources, markets, and economic activities. Furthermore, sector focus areas and SEZs are highlighted in the corridor to ensure that these areas are well connected to the hubs and that these serve as areas for policy focus. The corridor covers a total population of 45 million, with a GDP of $70Bn.

There is strong rationale for the development of ESNWJ as it includes several substantial opportunities for development. The corridor includes large income disparities, between urban and rural regions and across provinces within the corridor. The oil and gas sector (20% of corridor GRDP) is experiencing slower growth with depleting resources, and alternative engines of growth need to be developed. Further,

investment in the corridor has been declining in the past few years. Finally, there are still significant gaps in basic infrastructure (e.g. transport, amenities, and social infrastructure).

Figure A2-3. Hubs and nodes along the ESNWJ Corridor



Note: Kabupaten/Kota included in corridor are those within 50km of each hub and those crossed along the length of corridor; Rubber is fairly well spread across the 4 provinces – South Sumatera, Riau, Jambi, North Sumatera and given the lower volumes, separate focus areas are not highlighted on the map
Source: Badan Pusat Statistik; Expert interviews; City websites; Indonesia Investment Coordinating Board; BAPPENAS; National Spatial Planning PP no. 7, 2005; National Industry Policy PP no.28, 2008; BPS; Provinsi dan kabupaten dalam angka; Provincial government; BCG analysis

To overcome a number of difficulties, the vision of the ESNWJ corridor is to create a strong economic base with connecting and empowering infrastructure, complemented with targeted economic and social development measures to provide employment and achieve sustainable development. This vision of the corridor is achieved through the implementation of a two-sided strategy:

(1) Economic development strategy, with focus on connecting the region and growing key sectors

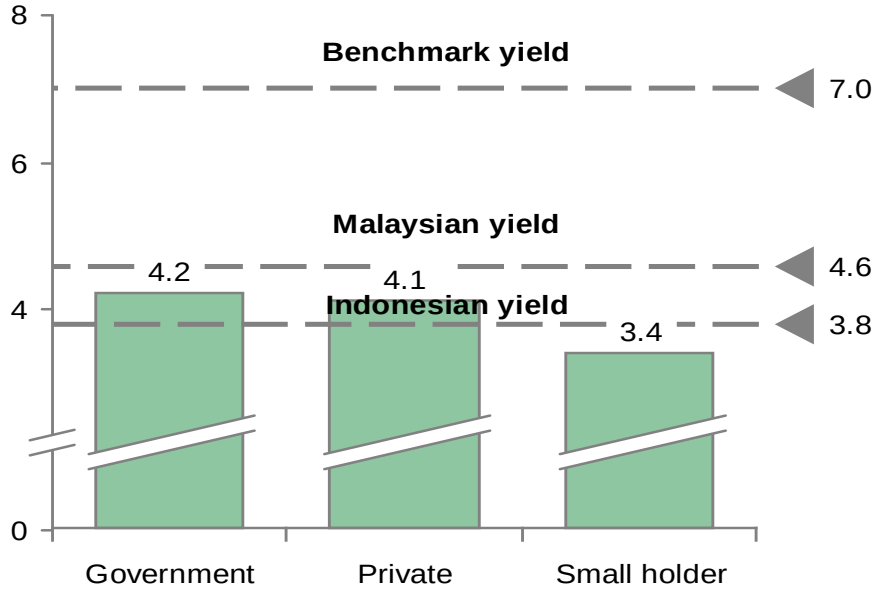
(2) Social and environmental development strategy, with focus on improving the employability of the workforce, improving living conditions in the rural regions, and strengthening the environment regulatory regime.

For the economic development strategy, three key focused sectors, palm oil, rubber, and coal mining, are selected as the priority sectors for development of the ESNWJ

corridor. For each of these focused sectors, in-depth analysis is conducted to identify key gaps, develop the growth strategy, and present the key enabling initiatives and infrastructure projects which are required.

Palm oil sector: The strategic focus of the palm oil sector is in the upstream part of the value chain, driven by the higher margins and projected healthy demand in the world market. The proposed strategy is to focus largely on improving yields, in particular those of smaller players. The ESNWJ corridor has the opportunity to more than double the current yield, thus resulting in significant growth. Furthermore, expansion of the area under mature plantation would contribute to growth in output as well. While the downstream part of the value chain will continue to suffer from overcapacity and thus lower margins, it remains an important strategic lever to offload upstream production

Figure A2-4. CPO yield in 2009 (ton/ha)



The following four key enabling initiatives are identified for the palm oil sector:

(1) Form an industry body for palm oil to focus efforts on its development.

(2) Provide financial and educational support to smallholders.

(3) Empower the workforce with enhanced education and training.

(4) Improve regulation (e.g. improve processes for land acquisition, government

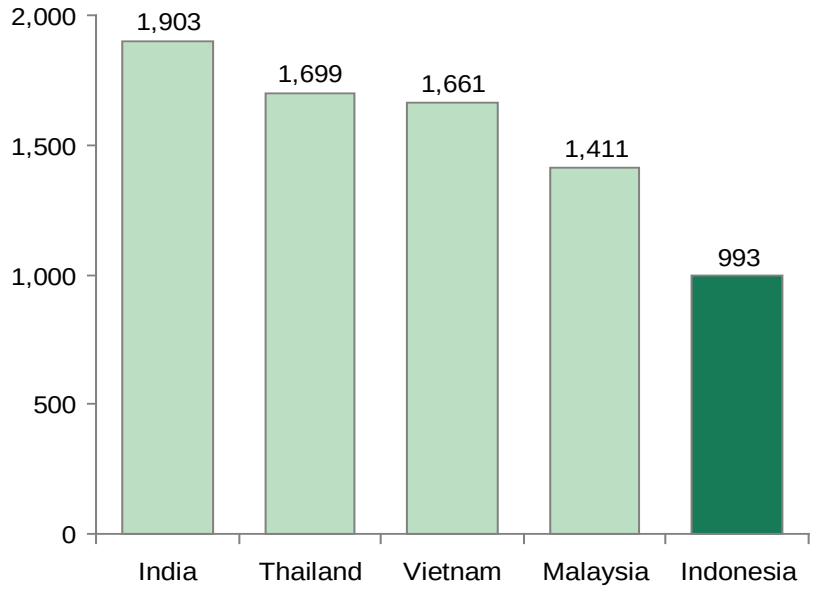
policies for the sector, and others).

In terms of infrastructure requirements, there are two key areas to be addressed. Firstly, expand capacity at the four major ports in Sumatera.

Currently, there is long waiting time at ports, and the situation is undoubtedly getting worse as the production of CPO increases. Secondly, improve land connectivity to facilitate transportation between plantations, mills, refineries, and ports.

Rubber sector: Rubber plantations are well spread across the corridor in four provinces: North Sumatera, Riau, Jambi, and South Sumatera. However, yields of those rubber plantations are low compared with international benchmarks (as shown in the figure). For the rubber sector, the strategic focus is twofold: improving yields upstream and intensify downstream industry. For the upstream business, improving yields should be achieved mainly through the facilitation of large-scale re-plantation, with a focus on supporting smallholders.

Figure A2-5. Yield from mature land (kg/ha)



The strategy to expand the downstream rubber business should focus on two attractive industries: tires and gloves. The tire industry consumes ~60% of rubber production and is a natural downstream business in which Indonesia can establish a major presence. The glove sector is a growing sector with healthy margins.

To implement these strategies, a number of enabling initiatives are proposed, including assisting smallholders through subsidies and support for re-plantation, investing in R&D to improve yield by developing higher yielding rubber plants, and providing a one-stop shop for investors to promote the downstream rubber industry and improve standards of governance.

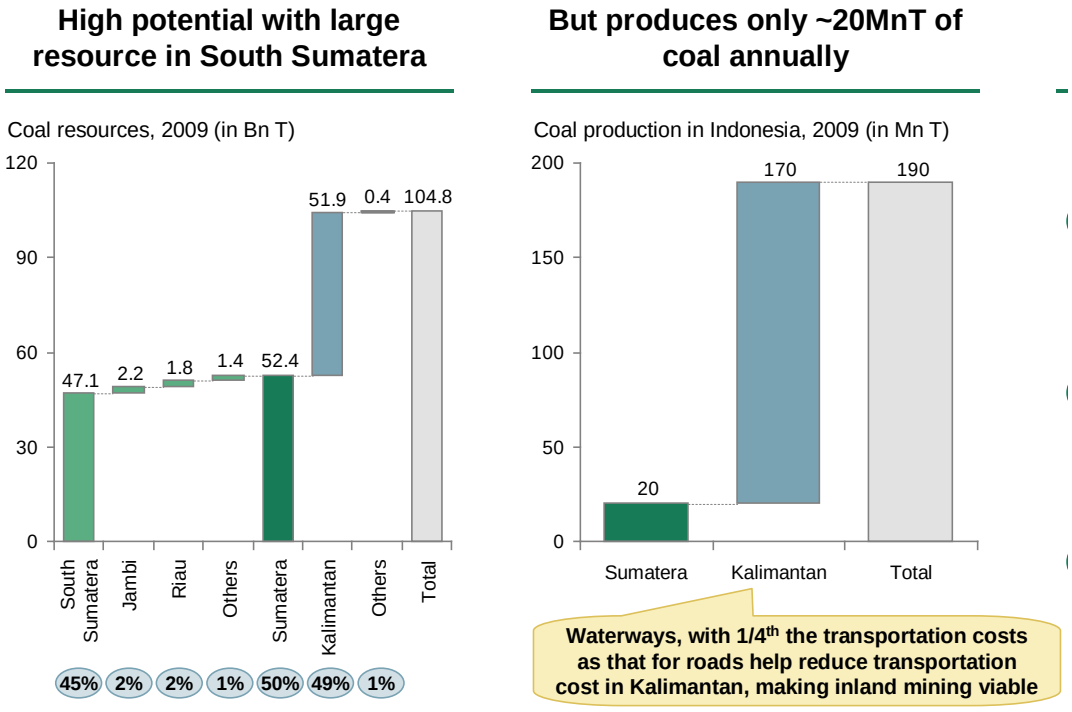
In terms of infrastructure project requirements, there are three key areas to be addressed. Firstly, we should improve capacity at ports to remove potential bottlenecks for rubber product exports. Similar to the palm oil sector, the rubber sector faces port capacity constraints which seem to worsen as production volume increases. This is particularly important for developing the downstream industry. Secondly, we must improve power availability and reliability to address downstream sector development needs. The target downstream sectors of tires and gloves are energy intensive manufacturing sectors with a critical requirement for an adequate and reliable energy supply. Thirdly, we should improve the road/rail network to address downstream sector requirements. There is a need for a robust logistics network (road/rail) between ports, warehouses, and manufacturing sites to support the development of the rubber downstream sector. Products like tires are bulky and require significant road/rail infrastructure support to ensure timely, cost effective manufacturing and delivery

Coal mining sector: There is great potential for the coal mining sector to grow into a strong pillar of economic growth for ESNWJ. Sumatera has significant coal reserves, especially in South Sumatera province, which is well placed to serve the increasing global demand for coal. Despite having similar resource levels to Kalimantan, Sumatra currently produces 20MnT of coal per year, compared to 170MnT in Kalimantan. The current low level of production is driven largely by the high cost of transportation to ports, as most of the mines along the corridor are inland.

Significant investment in railway infrastructure projects connecting major mines to ports will significantly reduce the transportation cost and provide a strong boost to the development of this sector in ESNWJ. In addition, creating an environment conducive to the development and operation of coal mines will help drive the further development of this sector. Three enabling initiatives have been identified. Firstly, empower the workforce with enhanced education and training. Secondly, improve overall

governance to promote investment in the sector. Thirdly, improve government policies and the process of land acquisition.

Figure A2-6. Coal resources and production in Indonesia (2009)



<u>Social strategy:</u> In addition to the economic development strategy, the social and environmental development strategy is developed for the two IEDCs, focusing on achieving three objectives.

(1) Improving the employability of the workforce.

(2) Developing suburban/rural areas to mitigate excessive urban migration.

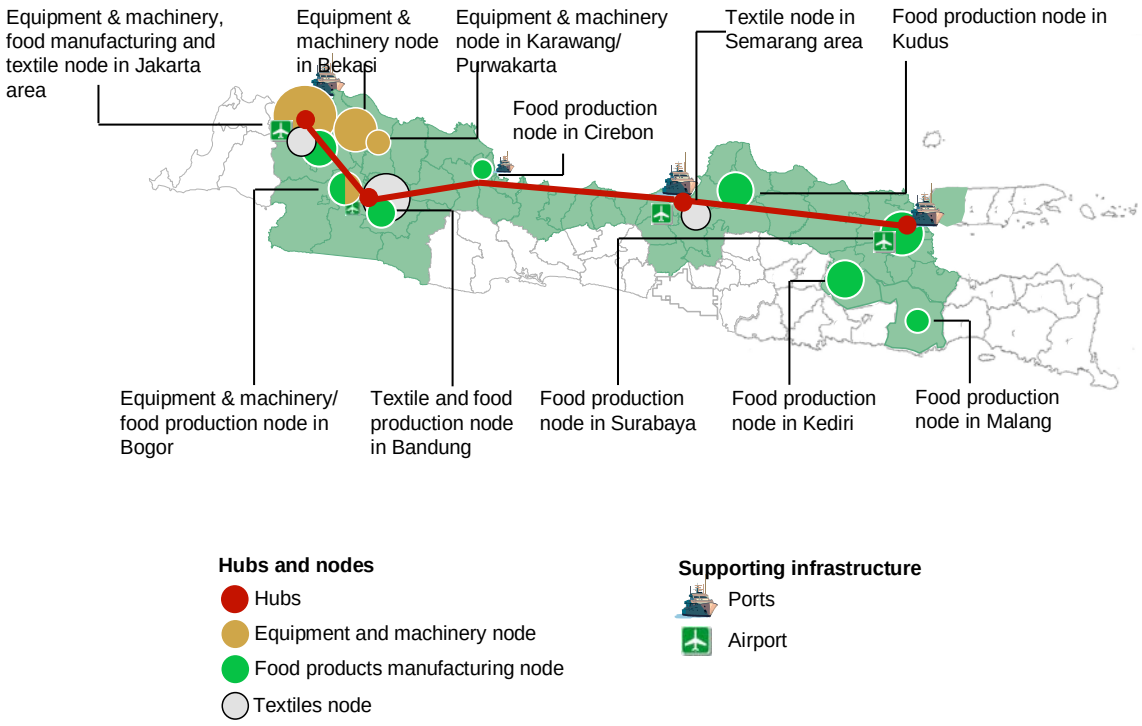
(3) Enhancing environmental governance to ensure environmental preservation and sustainable use of natural resources.

These objectives can be achieved by focusing on improving conditions in four key areas: a) education, b) healthcare, c) basic amenities, and d) environmental governance. Key gaps and recommendations are identified for each of the focus areas to help improve the positioning of the corridor. In addition, 29 projects are identified to improve social infrastructure along the corridor.

1-3-2. Northern Java Corridor

The Northern Java corridor connects the four key hubs of Java – Jakarta, Bandung, Semarang, and Surabaya. Jakarta and Surabaya are two mega hubs. The corridor enhances the connectivity between these hubs as well as rural areas thus allowing for spillover effects through improved access. The corridor covers a total population of 118Mn with a GDP of $180Bn. While Northern Java is an economically strong region in Indonesia, there are clear improvement opportunities in the region.

Figure A2-7. Northern Java Corridor

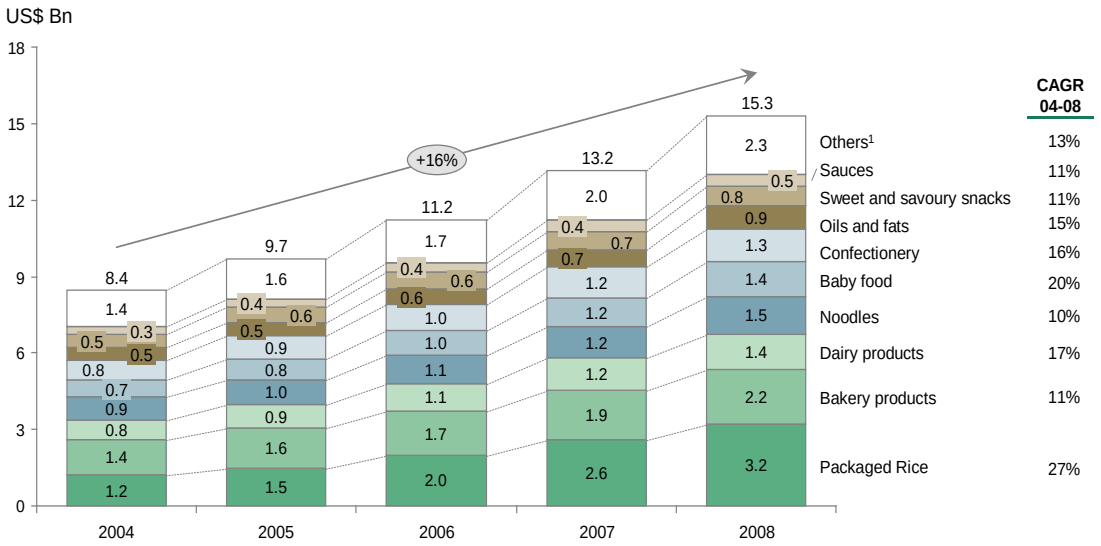


There exist large disparities in income levels between the hubs and their surrounding regions and among provinces along the corridor. There is significant potential to develop Northern Java further along the value chain climbing up to higher value-added activities. Further, domestic investment per capita into Northern Java is low compared to other regions in Indonesia. Finally, there are still significant gaps in basic infrastructure (transportation, amenities, and social infrastructure). The vision of the Northern Java corridor is therefore to create a strong economic base that provides employment and achieves sustainable development through infrastructure development and targeted economic and social development

In terms of economic development, Northern Java is an extremely diverse economy. To initiate the development process, three key focus manufacturing sub-sectors are identified in the Northern Java corridor: namely, food products manufacturing, textiles, and equipment and machinery. The overall development of the corridor will take place through initiatives beyond these sectors, too (e.g. improved connectivity and infrastructure investments), but these three sectors help us understand the key requirements for the success of the corridor and specifically provide recommendations on these sectors.

The food, beverage, and tobacco manufacturing sector: This sector contributes 26% of the manufacturing sector in Northern Java and 80% of total food production in Indonesia. Most of the production is in Jakarta, Bandung, Bogor, and Surabaya for food and beverage, while Cirebon, Kudus, Kediri, and Malang focus on tobacco.

Figure A2-8. Total sales of food manufacturing products in Indonesia



While the sector experienced growth in recent years, challenges pertaining to infrastructure and human resource shortages, as well as challenges in the judiciary landscape, restrict the sector from meeting its full growth potential. To go forward, the focus for this sector should be placed on removing barriers constraining its ability to grow in line with the strong domestic demand for food and beverage and promoting exports on selected high value added or indigenous products. By doing so, the key enablers would be to enhance the institutional framework and human capital to support

the growth of the industry. Firstly, there is a need to improve the legal system, in order to draw foreign investments. Secondly, we need to attract skilled foreign talent by improving the quality of life in the region and thirdly, to improve education and training to develop local talent.

Textile sector: This sector is one of the largest employers in Indonesia and is an important source of foreign exchange. Jakarta, Bandung, and Semarang are the main manufacturing nodes. To develop this sector, a strategy is required to recapture the domestic market as well as enhancing export by strengthening Indonesia's role as a sourcing country. Furthermore, there is potential to develop the value chain upstream to raw materials production and downstream to the design of garments to create greater vertical integration. The key enablers to develop this sector are to

- Enhance bilateral trade agreements with importing countries,
- Review labor laws (e.g. to address difficulties in hiring and firing, rigidity of working hours, and high cost of firing personnel),
- Provide financial support to upgrade aging equipment, and
- Provide incentives for high value added activities.

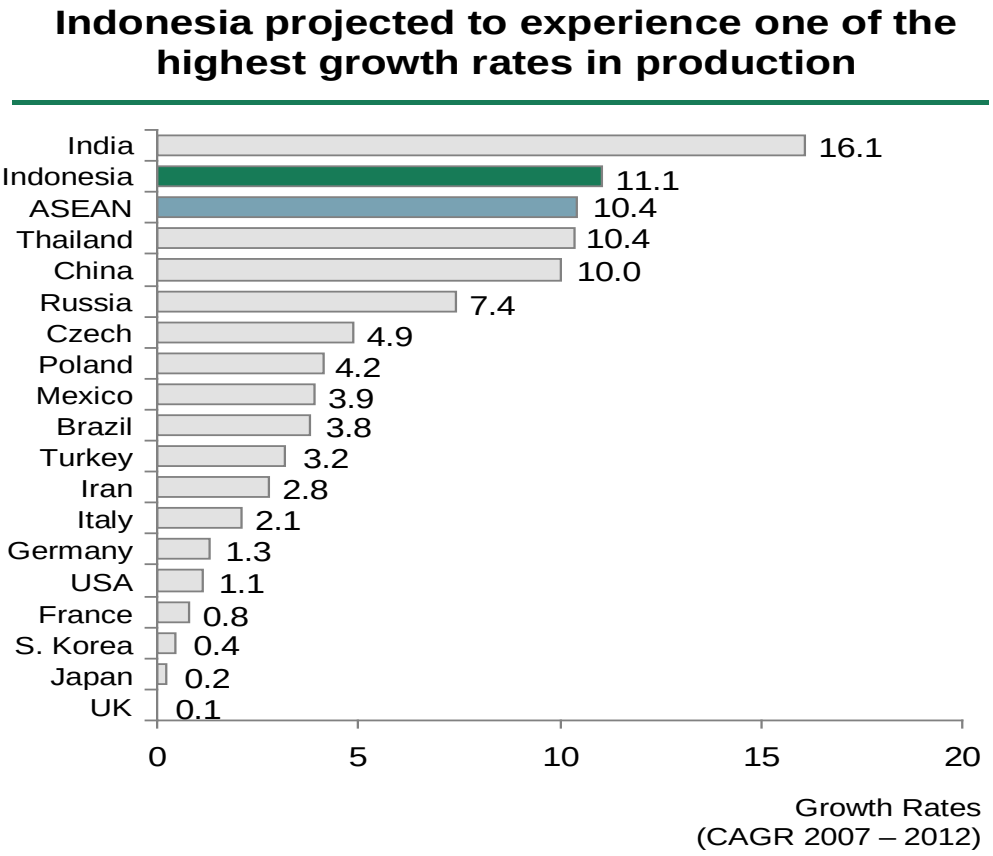
Equipment and machinery sector: This is the largest manufacturing sub-sector in North Java with transport equipment (components, motorcycles, and commercial and passenger cars) as the main focus. Jakarta, Bogor, Bekasi, and Karawang/Purwakarta are the main nodes. To further develop this sector, there is a need to foster supporting industries and develop capability for higher-value-added manufacturing, to strengthen relations with existing OEMs and to attract more OEMs to establish production bases and/or increase production capacity in Indonesia. This can be achieved by

- Promoting supporting industries and encouraging OEMs to locate their production base in Indonesia
- Encouraging knowledge transfer, and
- Improving education and training to develop a skilled local labor pool.

To ensure the development of each of the focus sectors as well as the development of the corridor, several specific infrastructure support initiatives, which are common across the focus sectors, are required. Firstly, there is a strong need to enhance port capacity, efficiency, and security. Focus industries in Northern Java face long lead

time and delays at ports. Increased port capacity is needed in order to avoid bottlenecks for exports as well as for domestic inter-island trade. Furthermore, improvements in port security are required to control the influx of illegal imports that affect the domestic textile industry. In line with the above, port-related auxiliary infrastructure such as roads leading to ports, warehousing, and consolidating facilities at ports also need to be developed as volumes continue to increase.

Figure A2-9. Compound annual growth rate projection of car production



Secondly, there is a need to enhance the rail and road network within the corridor. The lack of connectivity and poor road/rail conditions currently lead to increased cost and time. Thirdly, enhancing the power supply and its reliability is critical to supporting the growth of the manufacturing sector.

Above all, for the development of key sectors of NJ corridor, Jakarta port development in a critical enabler. For this, a comprehensive plan needs to be developed for the Jakarta region, inclusive of key industrial clusters that are needed for

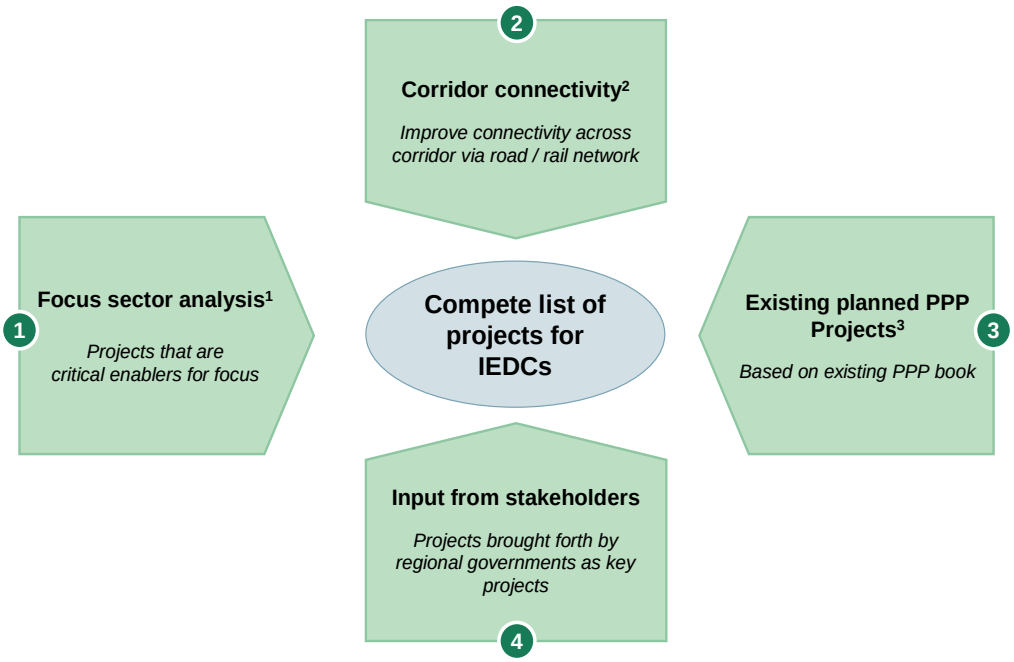
growth. A medium- to long-term Jakarta port development strategy needs to be developed with key infrastructure like rail, road, air transport connecting the industrial clusters to Jakarta port, and other key areas in Java, to support the growth of the corridor

1-4. Project Selection and Feasibility Studies

1-4-1. List of infrastructure projects

Infrastructure is a key enabler as well as a current barrier to the growth of each sector analyzed, for the two prioritized IEDCs. Thus, to ensure successful implementation of the corridor, key infrastructure needs to be developed. To construct a list of infrastructure projects, four key sources were used: a) focused sector analysis from master plans, b) corridor connectivity to help improve the linkage of hubs, nodes, and rural areas and benefit from spill-over effects, c) existing planned PPP projects, and d) inputs from stakeholders, inclusive of central and local government officials.

Figure A2-10. 4 key sources for identifying infrastructure projects



1. Based on sector demand-supply analysis, expert views from interviews and strategy development for the priority sectors 2. Projects required to connect the corridor by road/ rail and transportation traffic analysis from Halcrow 3. Includes all PPP projects in the corridor
Source: BCG analysis

The above cohesive process results in a comprehensive list of 88 infrastructure projects: 54 projects for the NJ corridor and 34 infrastructure projects for the ESNWJ

corridor. For successful implementation of the two priority corridors, all of the 88 projects identified are critical, and each of these would need to be implemented in the coming years.

Figure A2-11. Projects identified for ESNWJ and NJ Corridors

In total, 34 projects identified for ESNWJ corridor (I)

Serial No	Name of project
1	Bojonegara — Ketapang (jawa — Sumatera) Fe
2	Bojonegara Port expansion
3	Dumai Port expansion
4	Lampung Panjang port expansion
5	Palembang port expansion
6	Medan port expansion
7	New North Sumatera Coal Fired Steam Power P
8	North Sumatera (Infrastructure) 2x100 MW
9	Sumatera Mine Mouth Coal Fired Steam Power
10	Sumatera Mine Mouth Coal Fired Steam Power
11	Soekarno Hatta Airport — Manggarai, Railway D
12	Kualanamu Airport Railway Development
13	Simpang — Tanjung Api-Api Railway (87 kms)
14	Tanjung Enim — Batu Raja Railway (78 kms)
15	Lahat — Kertapati Railway (190 kms)
16	South Sumatera Coal Rail (~500 kms)
17	Medan Dumai Pekanbaru (660 kms)
18	Medan-Jakarta Railway (1,400 kms)
19	Medan Binjai Toll Road

Source: Expert interviews; Corridor masterplans; Industry reports; BCG ana

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In total, 54 projects identified for NJ corridor (I)

Serial no.	Name of project	Province	Project type	Source
1	Kertajati International Airport	West Java	Air	PPP
2	Port—Jakarta port expansion	Jakarta Special Capital Region	Port	Sector analysis
3	Port—Jakarta green field port	Jakarta Special Capital Region	Port	Sector analysis
4	Port—Semarang port expansion	Central Java	Port	Sector analysis
5	Port—Surabaya port expansion	East Java	Port	Sector analysis
6	Greenfield port, Tanjung Bulu Pandan Madura	East Java	Port	Input from stakeholders
7	Central Java Coal Fired Steam Power Plant (up to 2000 MW)	Central Java	Power	PPP
8	Power—Coal plant project 1 (up to 2000 MW)	West Java	Power	Sector analysis
9	Power—Coal plant project 2 (up to 2000 MW)	West Java	Power	Sector analysis
10	Power—Coal plant project 3 (up to 2000 MW)	West Java	Power	Sector analysis
11	Power—Geothermal plant project (up to 250 MW)[1]	West Java	Power	Sector analysis
12	Railway Facility—Blue and Green Line (Jakarta Monorail)	Jakarta Special Capital Region	Rail	PPP
13	Gedebage, Bandung Municipal, Integrated Terminal (Railway)	West Java	Rail	PPP
14	Rail—Jakarta to Surabaya	Multiple	Rail	Connecting hubs

1-4-2. Project prioritization and pilot project selection

All 88 projects prioritized in the two corridors are considered for prioritization with the following framework and sub-dimensions:

(1) Impact: Based on requirement/gap, social benefit, regional attractiveness, spillover effects, and investment size

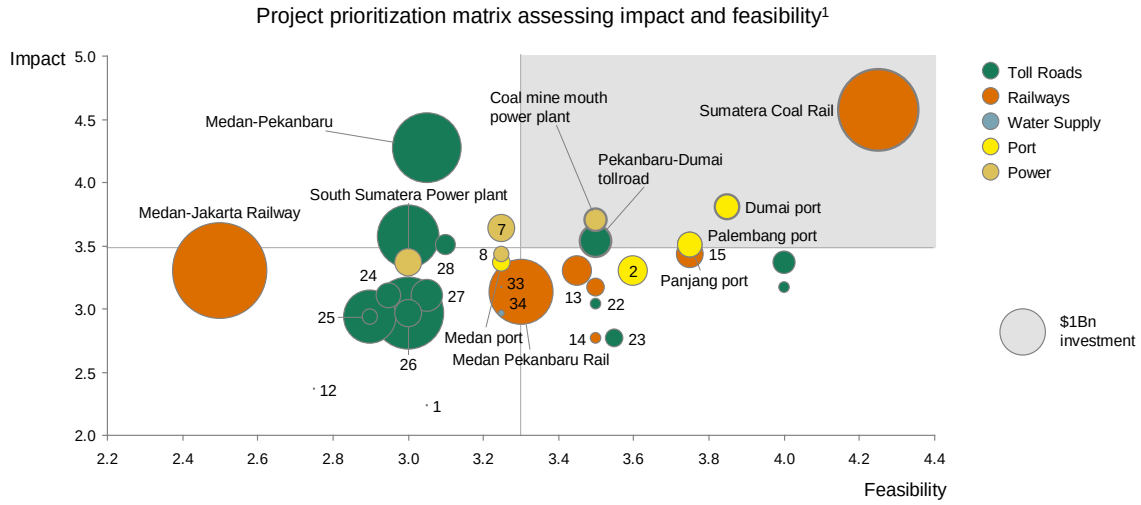
(2) Feasibility: Based on logistical complexity and project status

Each project is evaluated and analyzed in detail along the sub-dimensions of impact and feasibility to derive an overall score for the two dimensions.

The most attractive projects based on the above criteria were then looked into specifically, and the steering committee chose the pilot projects considering the following three key factors. Firstly, the project should not have been planned by another agency. Secondly, it should have a significant potential size to qualify as a pilot project and be a significant model case. Thirdly, it should minimize the number of agencies and parties required to lower co-ordination complexity and increase the chances of success.

Figure A2-12. Six potential pilot projects in ESNWJ

S. Sumatera rail, Dumai/Panjang/Palembang port, mine mouth power plant, Dumai-Pekanbaru road



The result of the above framework and the considerations from the steering committee resulted in the selection of the following five pilot projects for further analysis in feasibility and pre-feasibility studies:

1. *Dumai Port Expansion:* This project is a critical enabler in supporting the palm oil and rubber industries for ESNWJ IEDC as identified in sector analysis. This was therefore selected as a pilot project for feasibility study.
2. *Dumai-Pekanbaru Palm Oil Railway:* To improve the competitiveness of the palm oil industry by lowering transportation costs and providing easy access to Dumai port, the Palm Oil Railway was selected as another pilot project for feasibility study. This project, along with Dumai port, would have significant synergies and would therefore be more attractive for investors.
3. *Trans-Java and Trans-Sumatera Railway:* With the objective of improving connectivity across Sumatera and Java, to help rural areas connect with key hubs and nodes, Trans-Java and Trans-Sumatera railways were selected as key projects. Pre-feasibility studies are conducted to evaluate the attractiveness of these projects from financial and economic perspectives.
4. *Geothermal Power:* Given the need for power, as stated in the sector strategies for the two IEDCs and the aspiration of Indonesia to develop in a sustainable way, emphasis was placed on geothermal energy as a source of power generation.

A pre-F/S was commissioned for this key project, focusing particularly on the economics of geothermal energy, and on making it attractive for private investors.

1-5. Proposed Institutional and Financial Framework

1-5-1. Current PPP effort in Indonesia

Indonesia has been gradually increasing its focus on PPP projects to enable investments, particularly in infrastructure. In recent years, the Indonesian Government has made a renewed effort to improve PPP investments through 3 key initiatives:

5- The introduction of PPP-specific laws and regulations, e.g. laws that clarify and streamline processes for PPP identification, implementation, and regulations that assign responsibility for land acquisition by the government

6- The development of sector-specific laws and regulations, e.g. legislation that details requirements to acquire business, construction, and operating licenses.

7- The improvement of the institutional framework for PPP development, e.g. clarification of the role of the government counterparts for each sector and the establishment of ministerial-level policy body to promote and coordinate PPP development.

1-5-2. Role and set-up of PDF

The working group proposed that PDF be specifically used for corridor projects for various purposes including transaction advisory and feasibility studies. The PDF is to create an uninterrupted availability of funds for project preparatory activities to ensure a pipeline of credible, bankable projects. The PDF will not be used for financing actual PPP projects.

The PDF is to be established as a revolving loan facility, where contracting agencies (CAs) will need to commit a part of the total project procurement costs. Based on international benchmarking[2], the CAs cost-share could be approximately 25% of total project development costs. These costs will be recovered from successful

[2] India Infrastructure Project Development Fund prescribes that Sponsoring Agency provides up to 25% of total project development costs.

projects; however the CAs will carry the financial risk for unsuccessful bids. The PDF will also have a facility to provide grants for projects that might not be financially feasible but that have high economic and social returns. The PDF would be set up under PT SMI as these are existing limited companies established by the MoF to promote PPP investment.

1-6. Next Steps

This project has been delivered with comprehensive scope, inclusive of set-up of IEDCs, master plans for two priority corridors, institutional and regulatory framework, and infrastructure projects identification, prioritization, and feasibility studies for selected projects. A lot of these have been achieved while working together and ensuring a buy-in from the key stakeholders.

While significant progress has been made in this project, we need further support from all stakeholders to see it through to final implementation of IEDCs. Therefore, it is critical to successfully launch the pilot projects to benefit the people and the economy of IEDCs. In addition, given the high infrastructure requirements, the next wave of projects need to progress to a feasibility study stage. In addition, PDF and viability gap fund need to be established to ensure the implementation of selected projects. Beyond the current IEDCs, master plans need to be developed for the next wave of IEDCs (Kalimantan and Western Sulawesi).

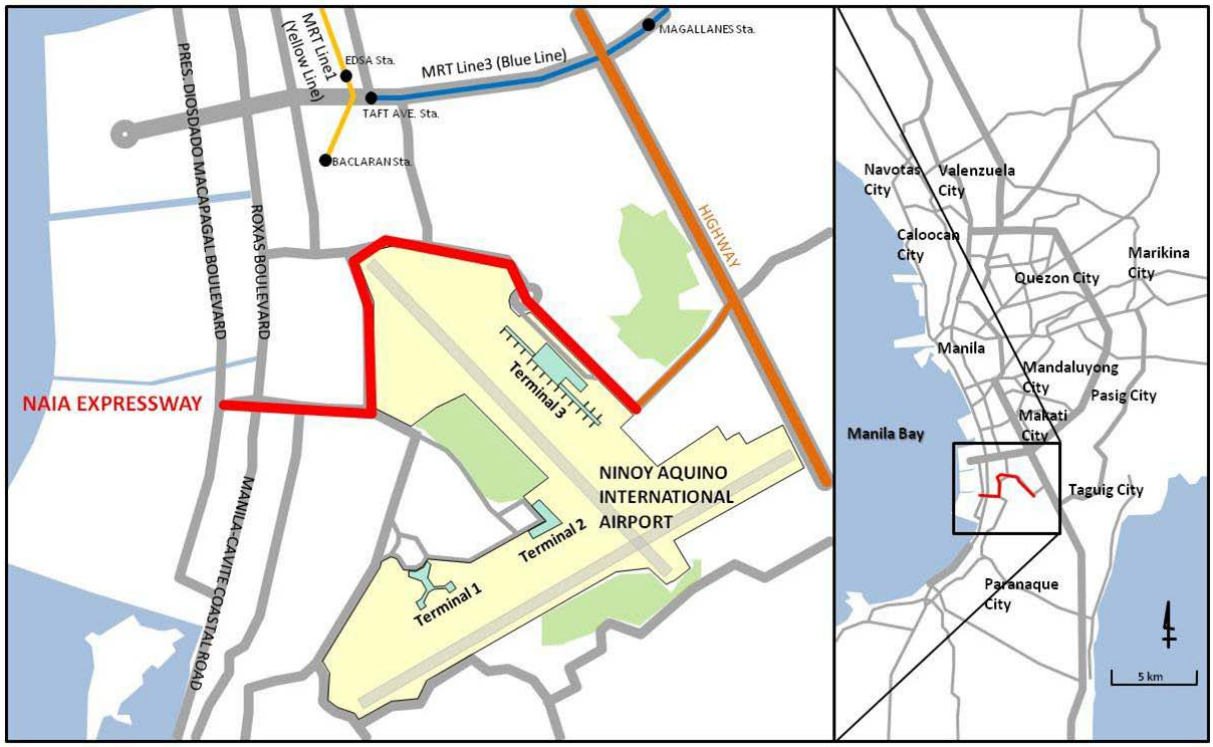
2. Other ERIA pre-F/S pilot studies in FY2009

2-1. The Philippines: NAIA (Ninoy Aquino International Airport) Expressway

Phase II of the NAIA Expressway connects Metropolitan Manila and Ninoy Aquino International Airport. Phase-II starts from Phase-I's closest point to the Airport, provides an approach to all three existing airport terminals by running along the periphery of the Airport, and merges with the DiosdadoMacapagal Road. The total length is 5.2km with a 4-lane elevated toll road, the total construction cost was US$240mil, the construction period was 4 years, and the concession period will be 25 years.

The project is sponsored by the DPWH (Department of Public Works and Highways), and the BOT scheme is proposed as Phase I. Since the IRR with toll fee only is assumed to be relatively small, it is suggested that a certain amount of public support is necessary to be attractive to the private sector. EIRR, in consideration of the public benefit from vehicle operating time and cost due to the anticipated mitigation of congestion, is estimated to be 27%, and the NPV of the benefit (Economic NPV) is US$120 million, figureswhich are encouraging from the government's viewpoint..

Figure A2-13. NAIA (Ninoy Aquino International Airport) Expressway

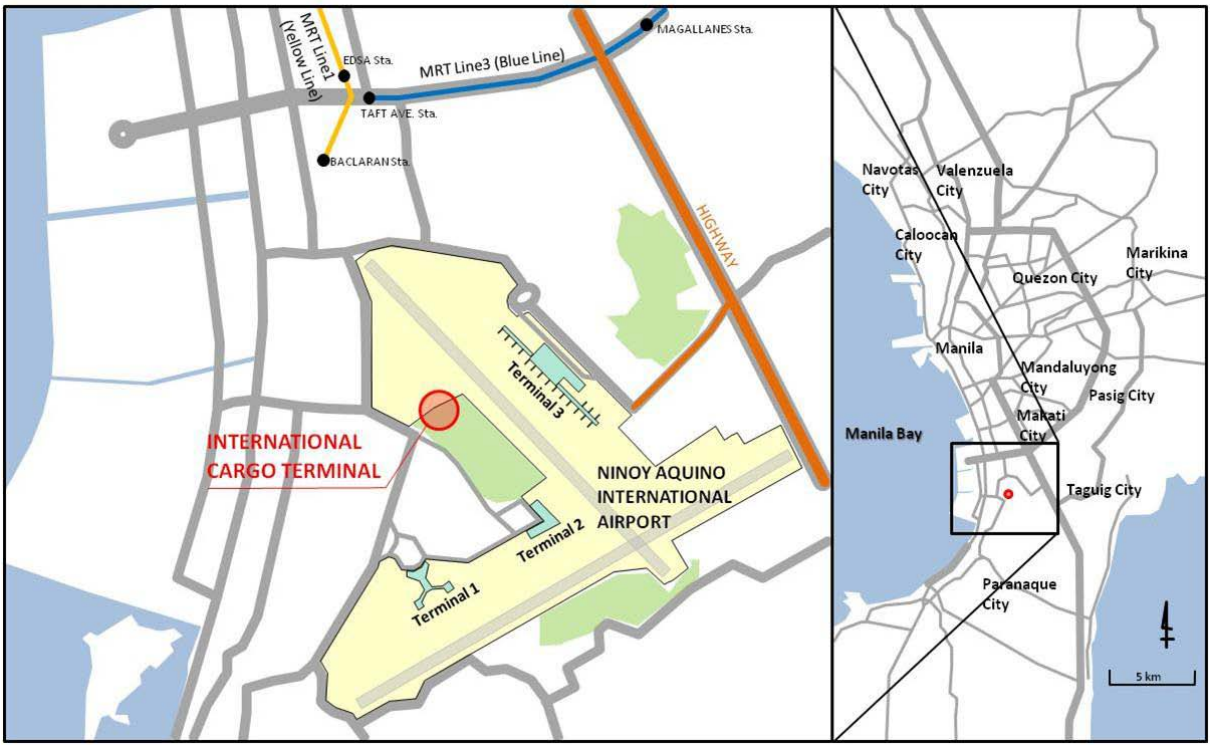


2-2. The Philippines: NAIA New International Cargo Terminal

This project involves the construction of a large-scale unified cargo terminal located inside the airport to provide reliable and well-organized services with good access to the aircraft. It represents a departure from the current situation, with scattered location bases operated by independent private companies with their small-scale cargo handling facilities in and out of the airport. The total construction cost is US$50 million, the construction period is 2 years, and the concession period is 25 years.

The project is sponsored by MIAA (Manila International Airport Authority). The terminal is equipped with facilities to unload from trucks, warehouses, offices, and to load onto the aircrafts. Those companies who are currently in operation should be encouraged to become the tenants of the new cargo terminal. Based on the tenant fee, IRR is estimated to be 21%, while EIRR is 41% and Economic NPV is US$200 million.

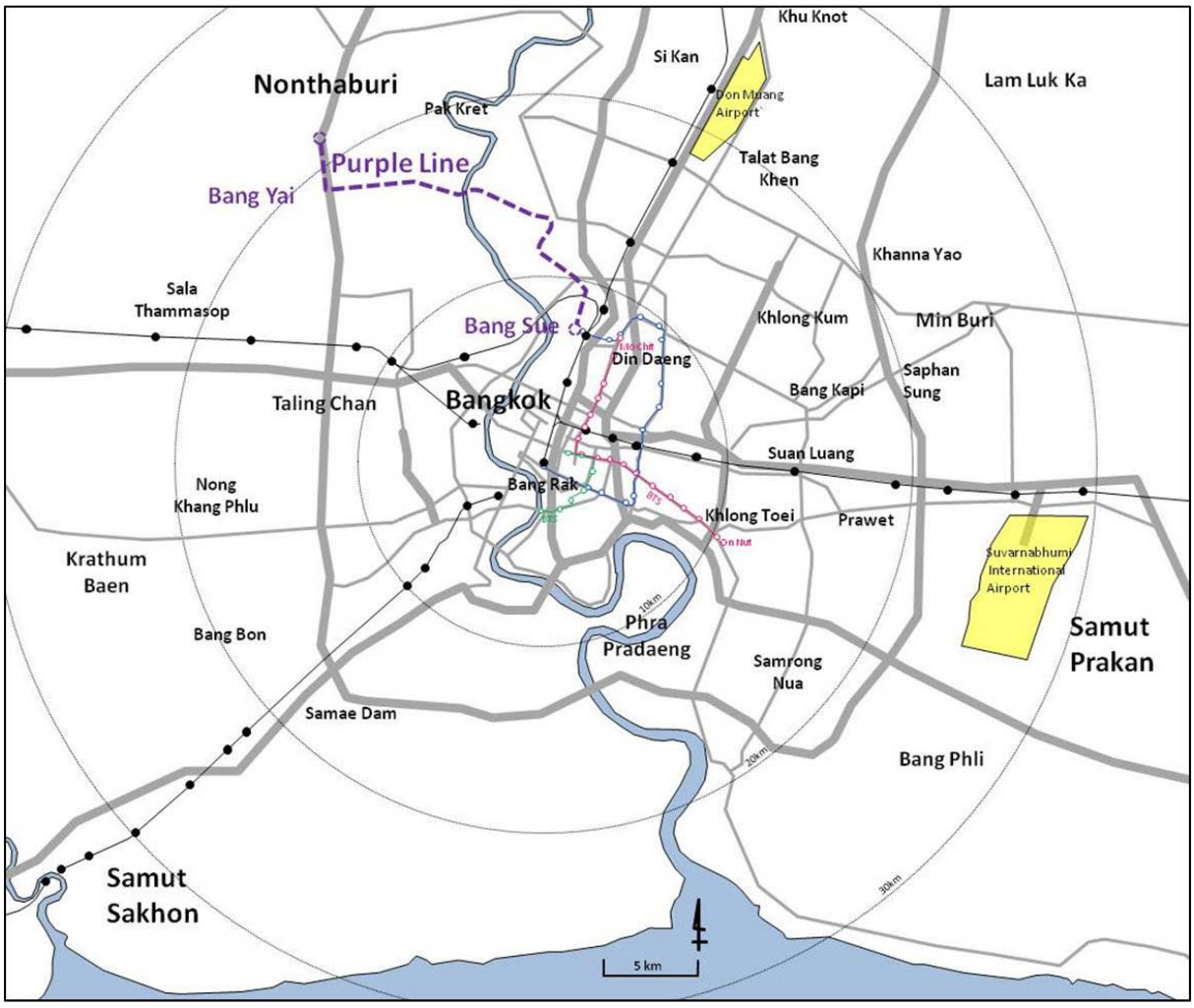
Figure A2-14. NAIA International Cargo Terminal



2-3. Thailand: The Purple Mass Rapid Transit Line in Bangkok

The project constructs the so-called Purple Line of the Mass Rapid Transit (MRT) network from Bang Yai to Rat Burana with a total length of 42.8 kilometers. It provides a commuter service between the suburban area in the northwest of Bangkok and the southern area via the old city center. The line is to be constructed in two phases: Phase A (from Bang Yai to Bang Sue (23.0km)) has been the focus of the feasibility study.

Figure A2-15. The Purple Mass Rapid Transit Line in Bangkok



A substantial part of the Purple Line is to be constructed as an elevated structure in suburban area while the section of the line located in the central area is planned to be underground. The civil works will be procured by the Thai Government with a loan from the Japanese International Cooperation Agency. The private sector will be responsible for the procurement, funding and installation of the rolling stock, and mechanical and electrical systems.

The initial investment cost is US$1 billion, the concession period is 30 years, and the

EIRR is 12.5%, based on the Unitary Payment by the Government, where net present value of the revenue shortfall between the Unitary Payment and the revenue generated by the Purple Line is estimated to be 11 billion Baht (US$330 million) over a 30-year period at a discount rate of 12.0%.

2-4. Cambodia: Inland Container Depot

This is an inland container depot project in Phnom Penh and Poipet for providing smooth and efficient customs clearance and mitigating traffic congestion in the suburbs of Phnom Penh and the border area of Poipet. In order for Cambodia to invite foreign direct investment and to enhance economic growth, it is essential to improve logistics infrastructure and the customs clearance system. Cambodia is strategically located along with the Southern Economic Corridor, a corridor from Bangkok to Ho Chi Minh City. This project is supervised by the Ministry of Public Works and Transport.

The location of Poipet Dry Port couldn't be finalized in the study because a new access road to the border for freight transport had not yet been decided by the Thai and Cambodian governments.

Phnom Penh International Dry Port (PIDP) will be located in Phnom Penh Logistic Park (PLP), which will be constructed to the north of a railway junction within the 2nd Intermediate Ring Road that is supposed to be completed by 2013, according to Phnom Penh Master Plan 2020.

The initial investment cost will be US$50 million including the cost of warehouses, cranes, forklifts, trailers and others, but excluding land acquisition. Leveling and access road upgrading should be the responsibility of the government. On this basis, IRR of the project is 19.3% with 35 years project life.

Since this study is the first study to set outa development plan for PLP and PIDP, the Ministry of Public Works and Transportation (MPWT) needs to confirm the development plan based on this report and a consensus/agreement on project implementation from the Cambodian Government needs to be reached, in order to proceed to the next steps.

Figure A2-16. Poipet

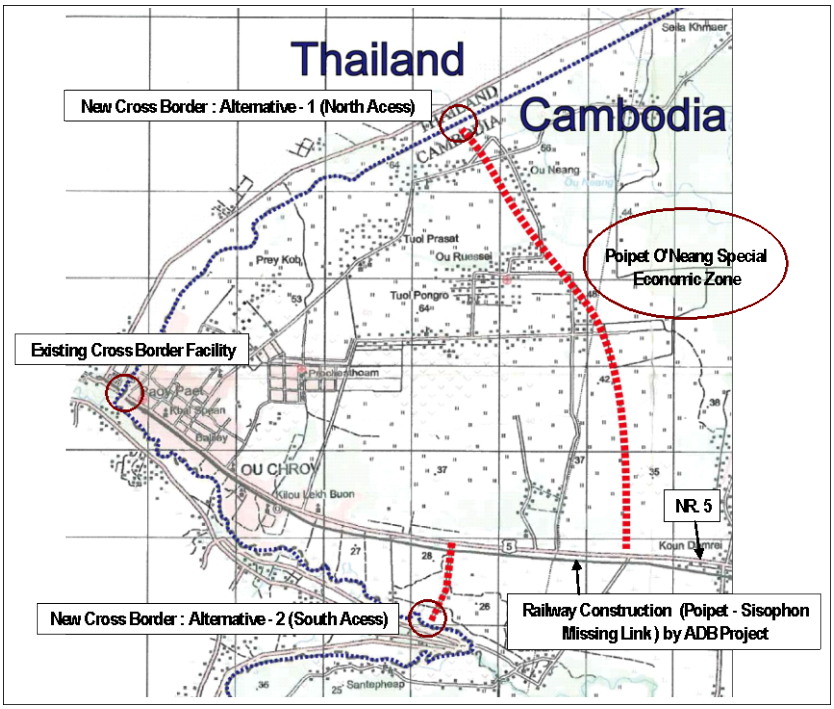
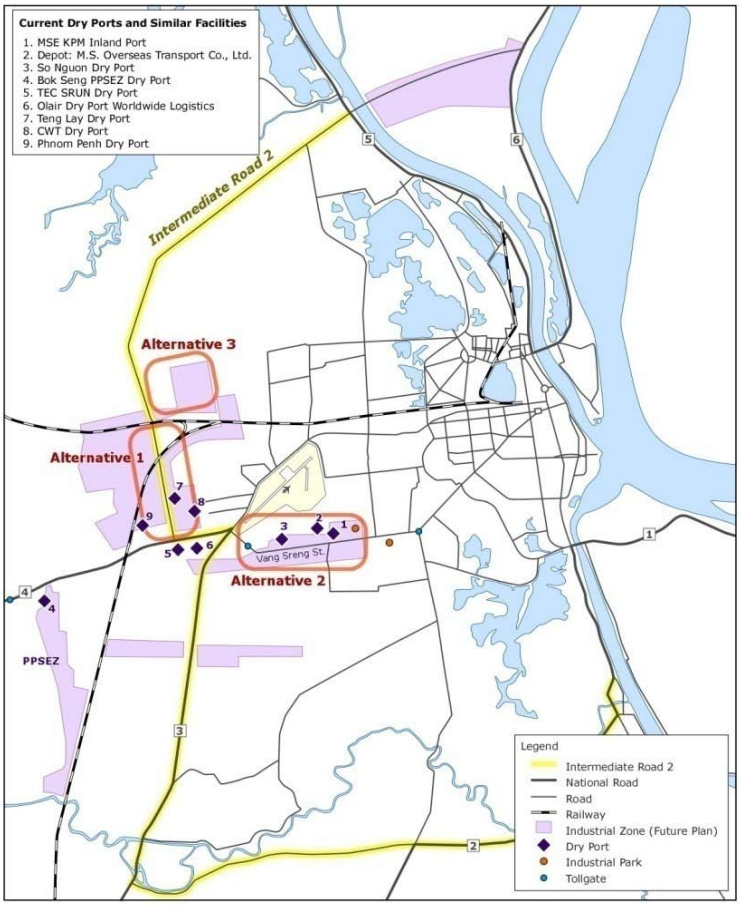


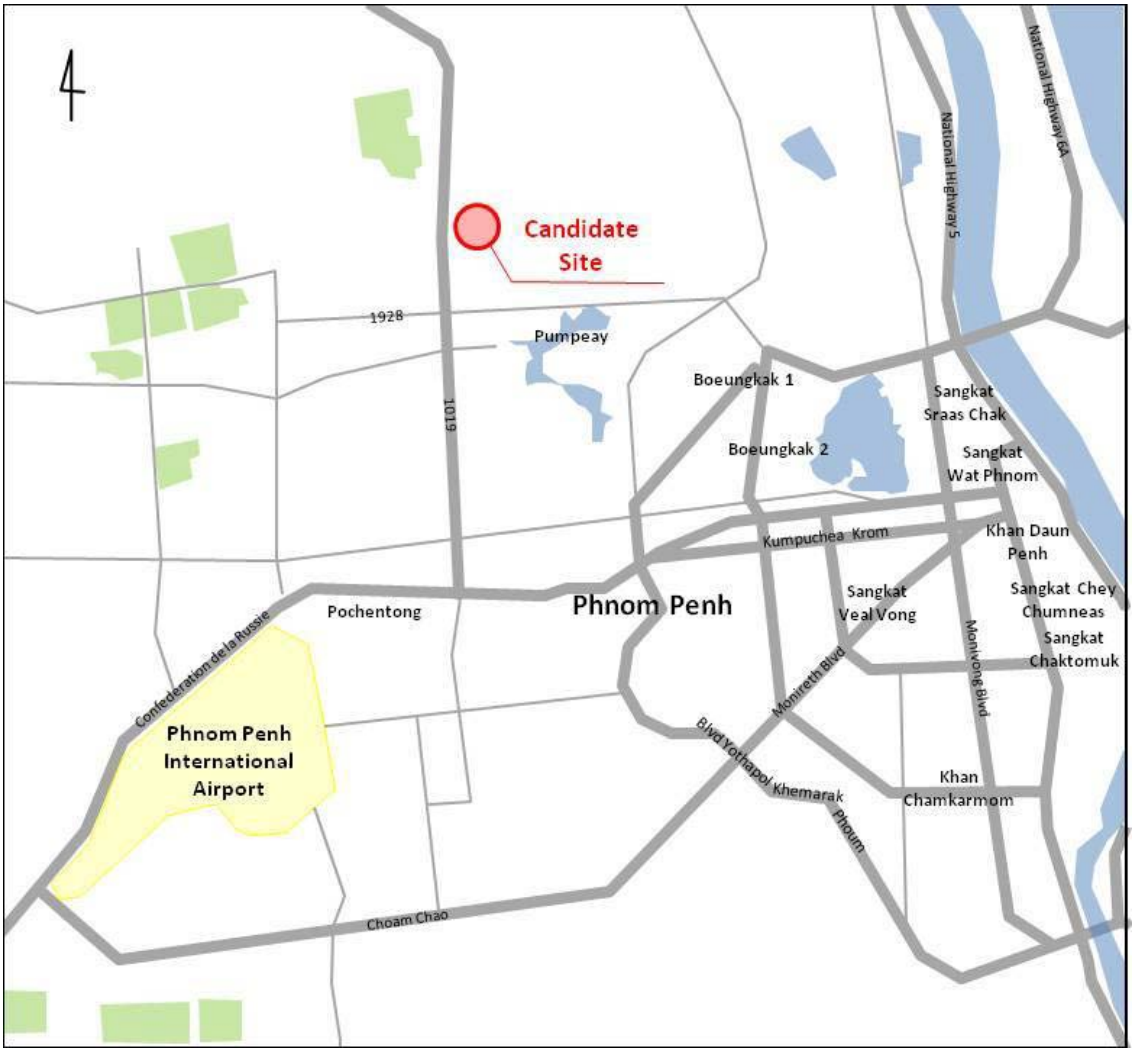
Figure A2-17. Phnom Penh (Alternative No. 3 is the recommended location)



2-5. Cambodia: A Medical Sector Project in Phnom Penh

The quality and the capacity of medical care services in Cambodia are obviously insufficient compared with neighboring countries, mainly due to the disruption caused by Cambodia's long history of civil war. Nowadays, increasing numbers of people are traveling to Bangkok, Singapore, and other places for quality health care services, and are spending a lot of time and money. In order to improve this situation and create a supportive environment for further economic growth in Cambodia by developing this key social infrastructure, this project establishes a state-of-the-art hospital and a post-graduate medical training center in Phnom Penh. A long term vision of the project is to build an ideal medical care system supporting sustainable development of the health sector in Cambodia, and to create a sound basis for medical excellence in the country and respond to Cambodia's efforts to reduce poverty and advance development.

Figure A2-17. Phnom Penh (Alternative No. 3 is the recommended location)



The 13,000 square meter hospital building will also house a post-graduate training center and provide adequate space for modern amenities and installation of various types of medical equipment of the highest international standards. It will also be equipped with solar panels, central heating, air conditioning, and a built-in network of pipes for supply of oxygen and fresh air. The hospital comprises four centers: Health Screening & Consultation Center, Neurological/Neurosurgical Center, Cardiovascular Center, and Oncology Center. The Post Graduate Training Center will train, on a regular basis, 60 medical professionals at a time in different healthcare disciplines.

The estimated total investment cost of the project is US$50 million. On the base case scenario, the project is estimated to yield US$12 million profit before tax. The net present value (NPV) at a discount rate of 10% is estimated to be US$10.3 million with 14% IRR in its 10 years project life.

2-6. Lao PDR: Zero Carbon Emission Data Center

This is a hydro-power-electricity-based data center project, harnessing the abundant water resources in Laos. The idea coincides with the Lao Government's policy that is focusing on development of new hydraulic power plants so as to be a hydro-power electricity exporter in Mekong.

The first plan, which was to set up a container type data center near a dam, was shelved due to low demand in early years and delayed IT infrastructure development in Laos. In the end, the project idea starts with a 100-rack data center business in the National Internet Center (NIC) constructed by the Lao National Internet Committee (LANIC). This project is supervised by the National Authority of Posts and Telecommunications.

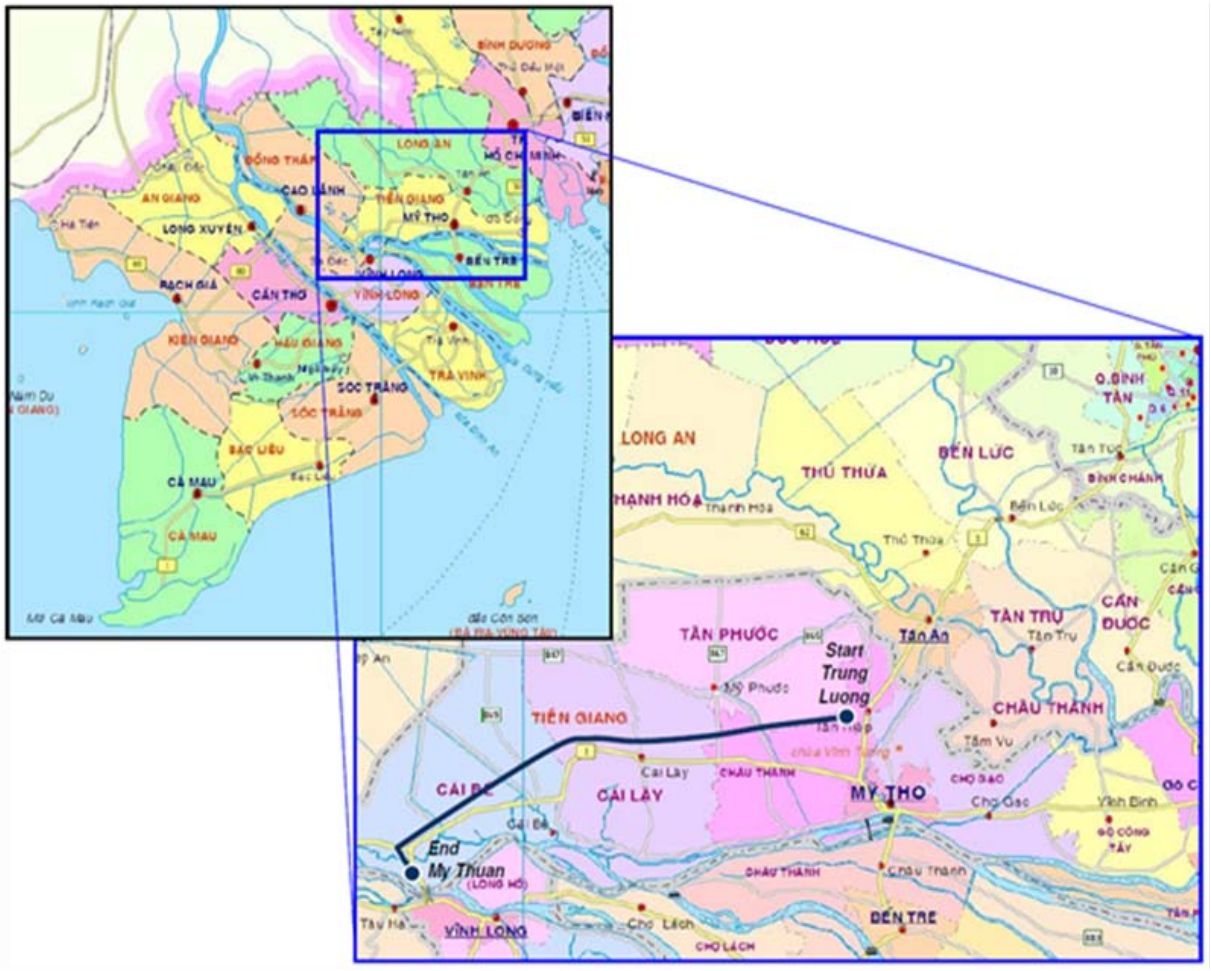
As its responsibilities, the Lao Governmentis requested to 1) rent floor space in the NIC at the normal market price for office buildings, 2) strengthen the data center utilities and security systems as required, and 3) reduce the cost of access to the Internet.

The above public support implementations are prerequisites because the project is not feasible until they are realized. In this case, NPV for 5 years is 64.78 million Japanese yen with nominal initial investment. However, the original plan should be investigated in the long term perspectives. In the long term, demand must drastically increase so as to enable the upscalingof the data center business in Laos, so it can begin to serve neighboring countries in the Mekong region.

2-7. Vietnam: Trung Luong-My Thuan Expressway

This is a 54.38km toll road project between TrungLuong and My Thuan, designed for vehicles traveling at 120Km/h. The road has 2x2 lanes in phase I, to be expanded to 2x3 lanes in phase II, and is constructed and operated by BIDV Expressway Development Corporation (BEDC) as a part of the Ho Chi Minh City to Can Tho Expressway. The implementation of this project is of high importance in boosting the socio-economic development of the Mekong Delta in Southern Vietnam. The construction work will be completed in 2013 with atotal project cost of VND22,042,816 million (US$1.16 billion).

Figure A2-18. Trung Luong − My Thuan Expressway



BOT scheme is proposed. BEDC will be the project entity, namely the shareholders. Bank for Investment and Development of Vietnam (BIDV), BECAMEX IDC Corporation (BECAMEX), Vietnam Urban and Industrial Zone Development Investment Corporation (IDICO), Petro Vietnam Finance Company (PVFC), Vietnam Coal – Mineral Industries Corporation (VINACOMIN), and Vietnam Shipbuilding Industries Corporation (VINASHIN)

will be the project sponsors. Domestic loans for the project are arranged and guaranteed by BIDV, and foreign loans are expected to be guaranteed by the Government of Vietnam.

Based on the feasibility study, the viability gap of the project is estimated at around 26.64% of the project's total investment capital, which is lower than the government's stipulated availability funding cap of 30%. The project IRR is estimated to be 14.30%, and equity IRR is estimated at 15.61%.

2-8. India: Chennai-Ennore Economic Industrial Corridor Master Plan and detailed feasibility study on a special economic zone (SEZ) project

The Master Plan aims at the enhancement of industrial agglomeration around Chennai and Ennore, a satellite city of Chennai, as a part of the Mekong India Economic Corridor. It is expected that the Chennai-Ennore area will become a world-class industrial cluster.

SEZ development attached to a major port with associated logistic infrastructure should be the basis for accelerating investment, employment, and further industrial development, especially in the automobile and automobile parts industry in this region. This project is supervised by the Industries Department, Government of Tamilnadu.

The Master Plan identified key clusters and industries in the region and worked out an infrastructure development plan for their development. It found that key industries of this region are IT, automobile and automobile parts, chemical and petrochemicals, electronics hardware, leather, and textiles. The plan is to invest US$15 billion from 2010 to 2035, including US$4.6 billion for PPP projects. Phase 1 runs from 2010 to 2015, focusing on eliminating bottlenecks and developing high-priority infrastructure. According to the Plan a total of US$1.9 billion is spent on developing SEZ, roads (new construction, expansion, and improvement), railways, and ports. It suggests that SPV for project implementation should be established and that decision making should be done by an apex committee whose chairman is Chief Minister

As a pilot project, the 780-acre Free Trade and Warehousing Zone located in Ennore adjacent to Ennore port was selected. This project has huge potential because 1) the government focuses on the development of north Chennai, 2) existing coal fired power plant and petrochemical plant while Ennore port is close to the project site, and 3) industrial and logistical clusters are already there. Based on this, a drastic demand increase is expected for container traffic at Chennai and Ennore. The basic idea for the project is a BOT base PPP scheme with a 30-year concession period amd a total project cost of US$378 million,

including US$250 million in construction costs. NPV is estimated at 337 million USD, and IRR is estimated at 20.1% (equity IRR 24.6%).

Figure A2-19. Connectivity between Mekong and India

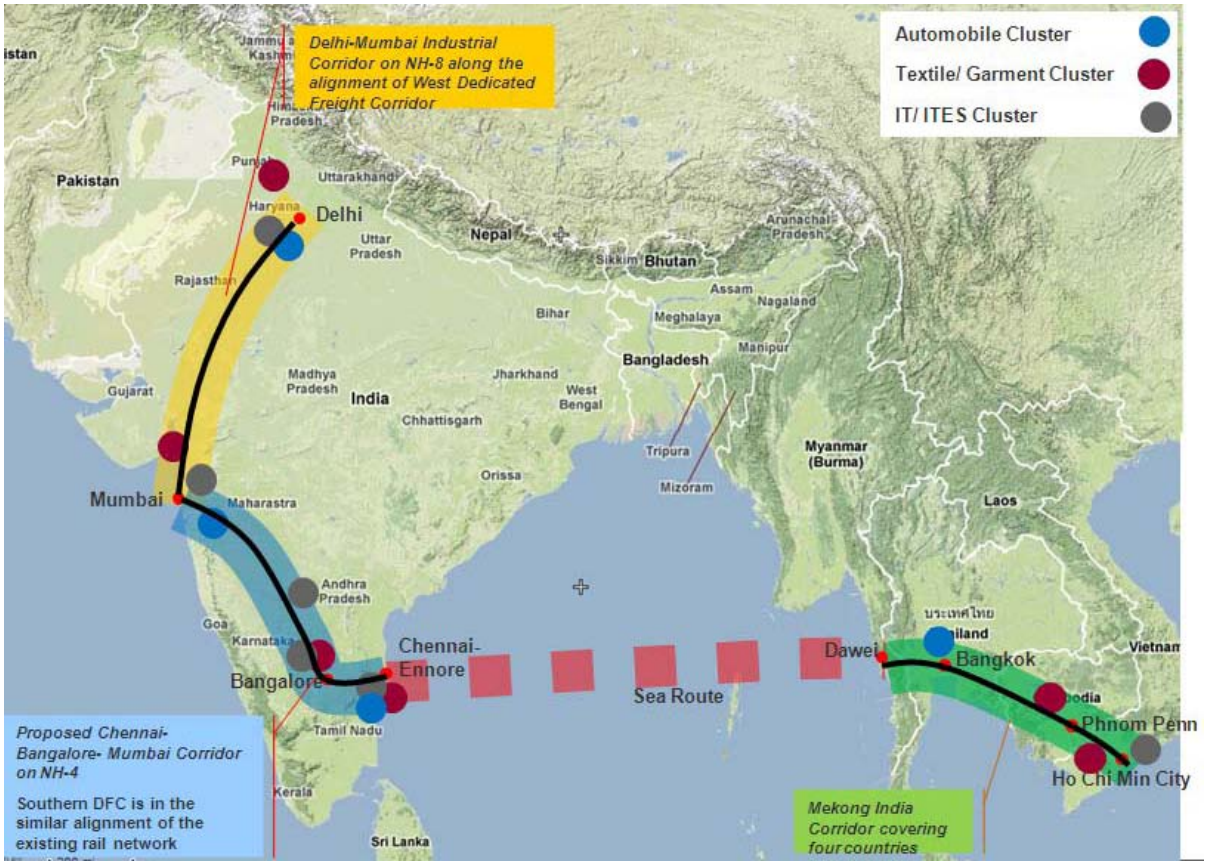


Figure A2-20. Chennai-Ennore Area

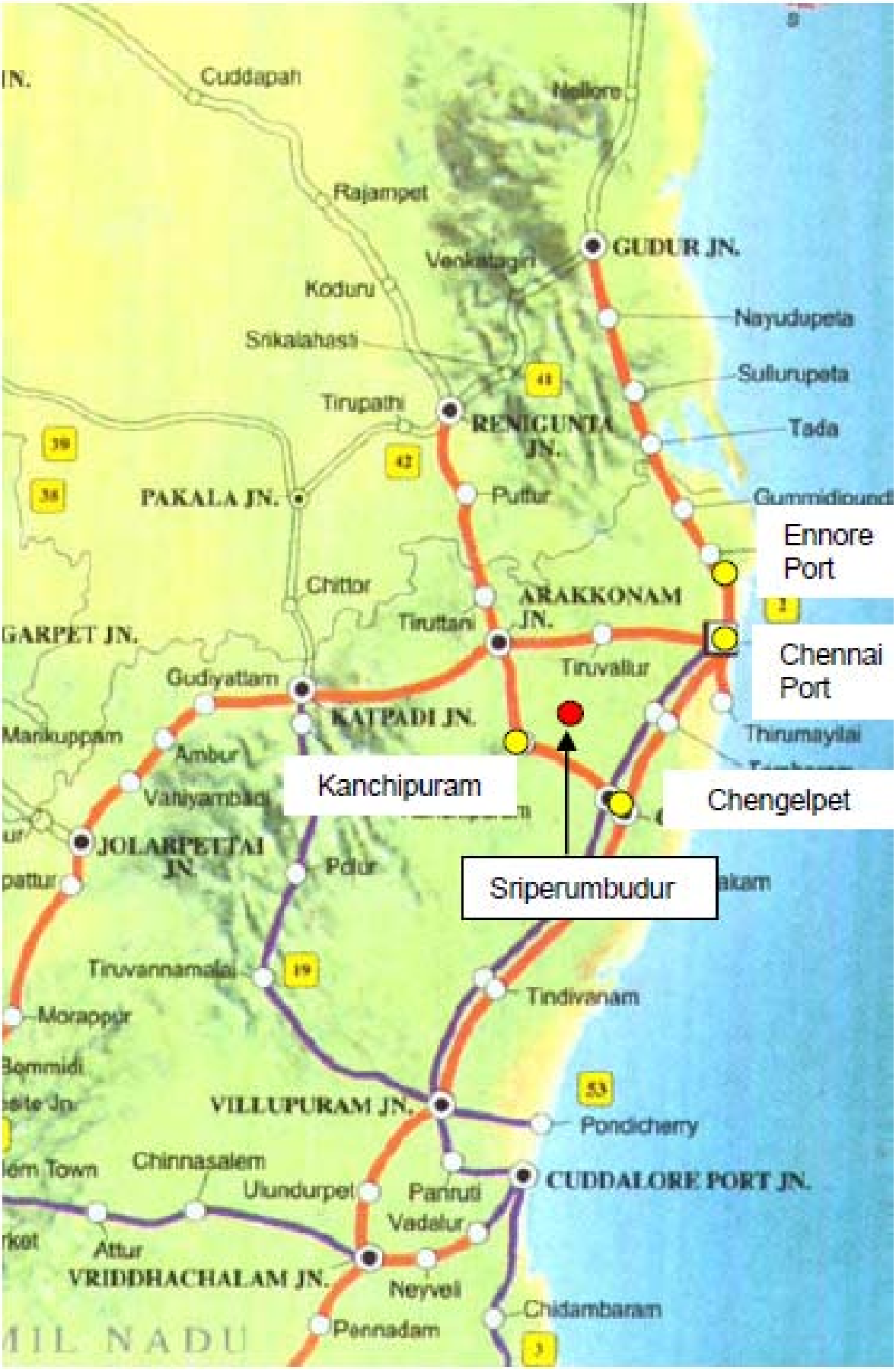
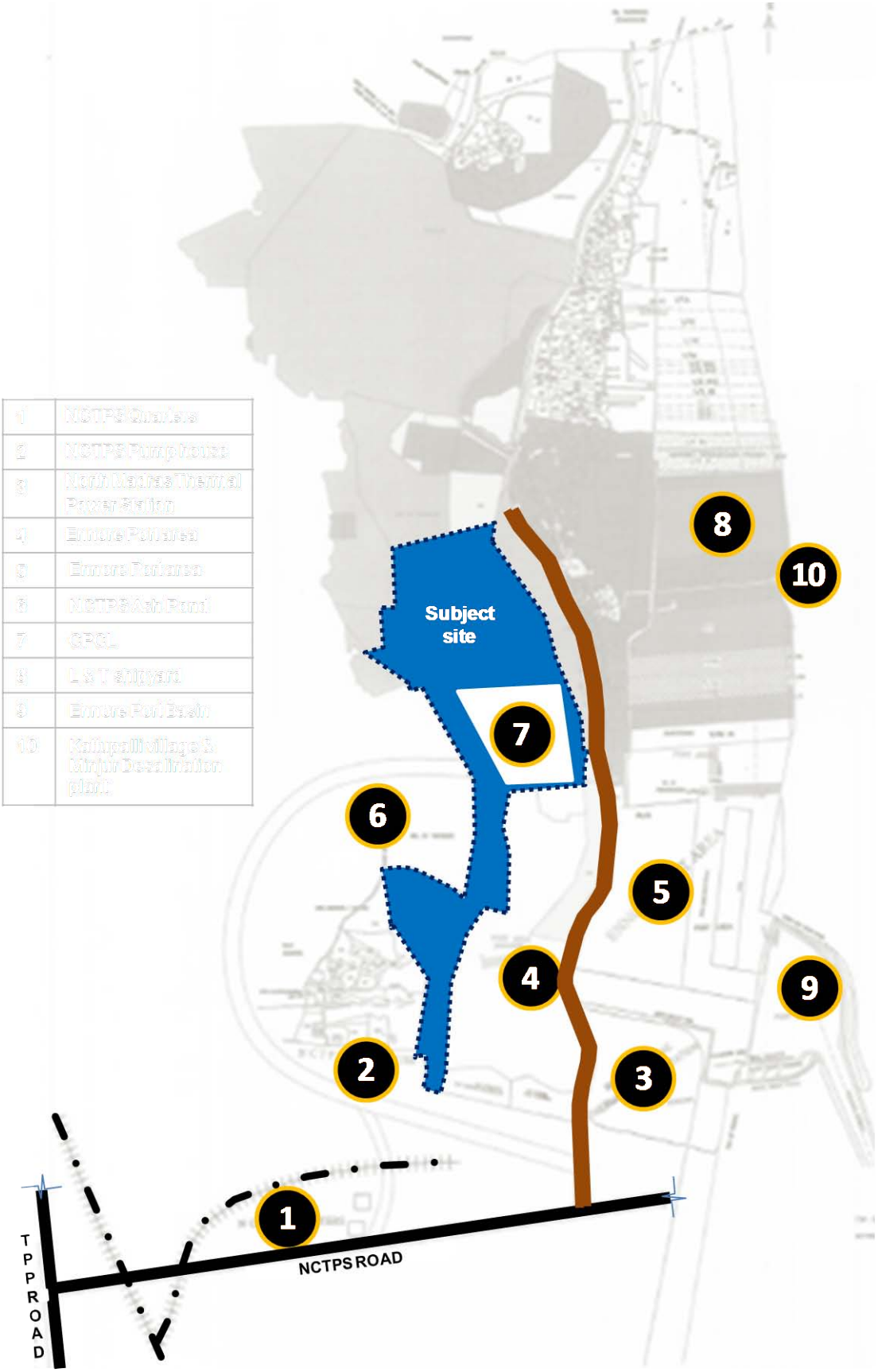


Figure A2-21. Ennore



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