

RESEARCHERS AT SINGAPORE'S *INSTITUTE OF SOUTHEAST ASIAN STUDIES* SHARE THEIR UNDERSTANDING OF CURRENT EVENTS

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### **Promoting Asia's Infrastructure for Regional Trade and Investment**

*By Sanchita Basu Das and Pham Thi Phuong Thao*

#### EXECUTIVE SUMMARY

- Asia has been leading the world's economic growth for the past decade with the development of international production networks as one of its key strengths. For sustained growth, the production fragmentation process is only profitable if the cost of transporting intermediate goods across borders is low in terms of time and money and this can be facilitated with better infrastructure. However, most Asian countries suffer from infrastructure deficiencies.
  - The region, in general, also remains below the world average in terms of quantity and quality of infrastructure. There exist wide gaps among the economies with regard to the trade facilitation and institutional processes.
  - The 2010 Master Plan of ASEAN Connectivity has focused on infrastructure development, i.e. physical, institutional, and people-to-people connectivity; and similarly, APEC, under Indonesia's Chairmanship in 2013, has set connectivity as one of its priorities.
  - How these organisations implement the connectivity projects will be keenly watched. This is important as (i) intra-regional economic activities in Asia and the Pacific are likely to increase with time, and (ii) ASEAN and APEC have substantial developmental differences among its member states which offers opportunities for expanding their production networks.
  - ASEAN and APEC are looking for economic integration by 2015 and 2020 respectively, and this needs to be supported through the building of physical infrastructure, the promoting of trade facilitation and an increase in people-to-people interaction.
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## INTRODUCTION

The Asian Development Bank in its April 2013 Economic Outlook reported that the Asia Pacific, largely driven by the domestic factor, will continue with its strong economic growth of around 6.6 per cent in 2013<sup>1</sup> (vis-a-vis 6 per cent last year). ASEAN is expected to show a resilient growth of 5.4 per cent, while the two giant economies – China and India – are likely to grow by 8.2 and 6.0 per cent respectively. In contrast, the advanced economies (the US, the EU and Japan) are forecasted to accelerate moderately by 1 per cent this year under conditions of uncertainty arising from fiscal tightening and period of consolidation.

Despite this positive economic projection for Asian economies, underinvestment in infrastructure, particularly in transport, energy and communication, remains a major concern. For example, electricity generation in India is 16-20 per cent short of what is needed to meet peak demand. In Indonesia, infrastructure investments dropped from 5-6 per cent of GDP in the early 1990s to 2-3 per cent of GDP for much of the last decade<sup>2</sup>.

As the population in Asia<sup>3</sup> is set to rise from 3.2 to 3.6 billion during 2008-2020<sup>4</sup>, this will cause additional strain on the physical infrastructure. In addition, an inadequate physical infrastructure will also impinge on components of growth, and become an impediment for effective regional integration and for distributing its benefits to less developed member states.

This has ramifications for the formation of an ASEAN Economic Community (AEC) by 2015. The region is envisaged to be a highly competitive single market and production base that is fully integrated into the global economy and pursues equitable economic development. Beyond 2015, ASEAN is considering the Regional Comprehensive Economic Partnership (RCEP) that would join ASEAN with six nations - China, South Korea, Japan, India, Australia and New Zealand – that are currently enjoying bilateral free-trade agreements with ASEAN and its members. All these will promote greater trade and investment within and beyond ASEAN.

Given this, the paper discusses the rationale for regional initiatives for building infrastructure. To start with, the paper gives a theoretical framework for increase in intra-regional trade, followed by empirical evidence from East Asian economies. The paper further gives a short account of the current state of Asian infrastructure and finally argues for better connectivity in the Asia-Pacific region.

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<sup>1</sup> *Asian Development Outlook 2013: Asia's Energy Challenge*, ADB, April 2013

<sup>2</sup> *Asia's \$1 trillion infrastructure opportunity* by Naveen Tahilyani, Toshan Tamhane, and Jessica Tan; McKinsey Quarterly, March 2011

<sup>3</sup> Defined as ASEAN, China, Japan, South Korea and India

<sup>4</sup> *Infrastructure for a Seamless Asia*, ADB and ADBI, 2009

## THE PRODUCTION NETWORK AND THE RISING TRADE: A THEORETICAL FRAMEWORK

Trade in Asia has soared over the past two decades (*Table 1*). While China's exports grew at an average of over 18 per cent a year between 1991 and 2011, that of ASEAN's went up by 12 per cent per year. China became the largest trader in Asia with Japan sending approx. 20 per cent of its goods to China, South Korea 24 per cent and ASEAN nations 10-14 percent.

**Table 1: International Trade in Asia**

Country	Exports		Imports		Exports to China (% of total export)	
	2011 (US\$ billion)	Average growth rate 1991-2011 (%)	2011 (US\$ billion)	Average growth rate 1991-2011 (%)	1991	2011
China	1,901.5	18	1,742.9	18	--	--
Japan	822.6	5	854.1	7	2.7	19.7
Korea	556.6	11	524.4	10	1.4	24.1
India	303.0	15	464.4	17	0.3	6.3
Indonesia	200.6	10	176.9	10	4.0	11.4
Malaysia	228.1	10	187.5	9	1.9	13.1
Philippines	48.3	9	64.1	8	1.5	12.6
Thailand	226.4	11	228.8	9	1.2	11.5
Singapore	409.5	10	365.8	9	1.5	10.4
Vietnam	96.9	21	104.0	21	0.9	11.5

Source: CEIC Database, authors' calculation

What could be driving up this trade? According to Baldwin (2006<sup>5</sup>, 2011<sup>6</sup>), during the 1980s and 1990s, instead of building an entire supply chain in a single country, nations industrialised by constructing a supply chain across borders. In other words, no single nation produced all the parts and components for an aircraft or a car. Industrial activities got divided across nations with some being a headquarter economy and others being factory-economies. This is called the ‘2<sup>nd</sup> unbundling’<sup>7</sup> or production fragmentation (or networks).

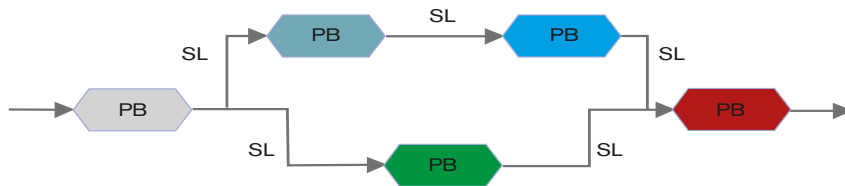
The mechanics of production networks can be further analyzed using the fragmentation theory (Jones and Kierzkowski, 1990)<sup>8</sup> that pointed out differences between trade in intermediate goods and trade in finished products, thus cutting out production blocks (PB), and developing service link (SL) in a firm’s entire production process. *Figure 1* illustrates this idea. A firm, that was originally producing an entire product in a factory, can separate some of the production activities according to its characteristics of labour or capital intensive, and can reduce the total production cost.

**Figure 1 : The Fragmentation Theory - Production blocks and Service links**

Before Fragmentation



After Fragmentation



PB: Production Block  
SL: Service Link

5 Globalisation: the great unbundling(s), Richard Baldwin, Prime Minister's Office, Economic Council of Finland, September 2006

6 Trade and Industrialisation after Globalisation's 2nd Unbundling: How Building and Joining a Supply Chain are Different and Why it Matters, Richard Baldwin, NBER Working Paper Series 17716, December 2011

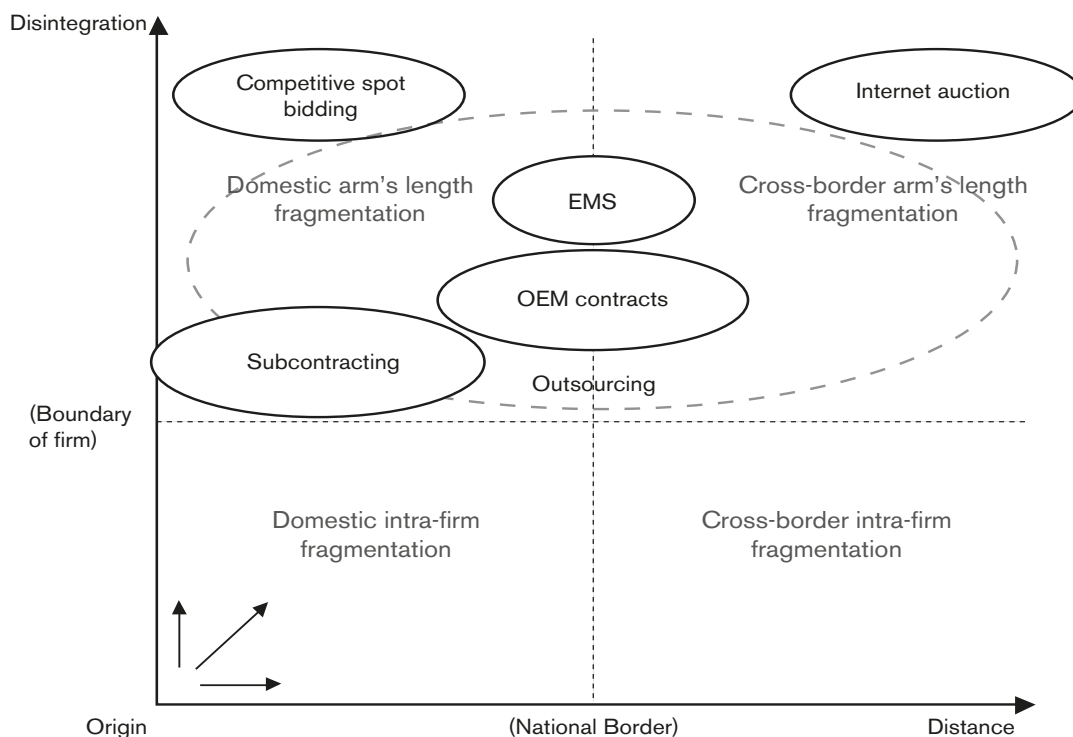
7 The '1st unbundling' is the characteristics of globalization which is defined as the separation of production and consumption.

8 Jones, R.W., and H. Kierzkowski. The Role of Services in Production and International Trade: A Theoretical Framework. In *The Political Economy of International Trade: Essays in Honour of Robert E. Baldwin*, edited by R.W. Jones and A. O. Krueger. Oxford: Basil Blackwell, 1990.

The same phenomenon of international fragmentation of production at the sectoral level can be observed in ‘intra-industry vertical specialisation’ i.e. goods that earlier used to be produced entirely in one country, which now with lower production cost on better ICT facilities and lower tariffs can be fragmented as intermediate goods, that can cross international borders multiple times and can become vertically specialized across countries. For example, to produce jeans, Levi may purchase South Korean yarn; have it woven and dyed in Taiwan by a subsidiary; send the fabric to be cut in Bangladesh by a subcontractor; ship the pieces for final assembly to affiliates in Cambodia and Thailand, where the garments are matched with Japanese zippers, and finally delivered to geographically dispersed affiliated retailers in North America and Europe<sup>9</sup>. As Multi-nationals have become leading players in international trade, vertical specialization has developed in parallel with vertical Foreign Direct Investment (FDI) operations.

Kimura and Ando (2005)<sup>10</sup> extended the concept of fragmentation to a two-dimensional one. In addition to fragmentation in geographical distance, the extended framework introduced fragmentation in disintegration, where a firm decides whether to keep some economic activities inside the firm or to outsource them to unrelated firms. This explains the formation of industrial agglomeration (*Figure 2*).

**Figure 2: Two-dimensional Fragmentation – An Illustration**



<sup>9</sup> Based on Magretta, J., “Fast, Global, and Entrepreneurial: Supply Chain Management, Hong Kong Style”. *Harvard Business Review*, September-October 1998.

<sup>10</sup> Kimura, F., and M. Ando. *Two-dimensional Fragmentation in East Asia: Conceptual Framework and Empirics*. *International Review of Economics and Finance* 14(3): 317–348, 2005.

This phenomenon of production network/ fragmentation theory expanded further with (a) improvements in transportation and information technologies; and (b) continuing efforts to lower institutional barriers in international trade, investment and finance.

The degree of participation in production networks as well as the degree of sophistication of production networks differ across countries/regions, depending on the availability of certain conditions (location of production blocks and service links costs, economies of scale). It is crucial to classify geographical location and the stages of development into three tiers in terms of the degree of participation in production networks (ERIA, 2010)<sup>11</sup>.

- Tier 1 includes countries/regions that are already in production networks and industrial agglomerations have started to form. Innovation should be promoted.
- Tier 2 consists of countries that are not yet fully integrated into quick and high frequency of production networks. A closer linkage should be set up.
- Tier 3 comprises those which are remote from industrial agglomerations. For these, reliable logistics connectivity should be developed.

## THE PRODUCTION NETWORK AND THE RISING TRADE AMONG EAST ASIAN ECONOMIES

East Asian economies (Japan, South Korea, China and big ASEAN economies) is said to have formed the most advanced production network in the world, although Multi-national enterprises (MNEs) from America, and Europe also took advantage of it (Kimura and Obashi, 2011)<sup>12</sup>. Machineries were most suited for fragmentation of production because they consist of a large number of parts and components, each of which is produced by diversified technologies and inputs.

*Table 2* provides some facts about intra- and extra- regional exports in East Asia. It highlights the increasing importance of machinery parts and components to East Asia's trade. In particular, the proportions of ICT-related parts and components in intraregional trade have remained notably high, and the intraregional share of exports of ICT-related parts and components has increased. This clearly showcases the development of international production networks within East Asia.

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<sup>11</sup> ERIA. (2010) *Comprehensive Asia Development Plan* (<http://www.eria.org/projects/CADP.html>)

<sup>12</sup> *Production Networks in East Asia: What We Know So Far*, Fukunari Kimura and Ayako Obashi, ADBI Working Paper Series, No. 320, November 2011.

**Table 2: Intra-regional and Extra-regional Exports by East Asia**

	Intra-regional Exports				Extra-regional Exports				Intra-regional Share in Exports to World	
	Value (US\$ million)		Product Composition, % of total		Value (US\$ million)		Product Composition, % of total			
	1994	2007	1994	2007	1994	2007	1994	2007	1994	2007
All Manufactured Goods	4468	11035	80	78	6415	14897	89	87	41	43
Machinery	2579	6607	46	47	4278	9266	59	54	38	42
P&C	1405	4292	25	30	1669	3314	23	19	46	56
(ICT-related goods)	816	2433	15	17	844	1310	12	8	49	65
Finished Products	1174	2315	21	16	2610	5951	36	35	31	28
(ICT-related goods)	428	1035	8	7	1086	2456	15	14	28	30
Other manufactured goods	1889	4428	34	31	2136	5631	30	33	47	44
Merchandise trade, total	5585	14106	100	100	7233	17166	100	100	44	45

*East Asia comprises of ASEAN+ China, India, Korea, Japan, Australia and New Zealand*

*P&C: parts and components*

*Source: Kimura and Obashi, 2011*

In the case of East Asian economies, the development of logistics infrastructure is closely linked with the degree of participation in production networks. Hence, as the fragmentation theory calls for a reduction in service link costs, one of the key regional initiatives, when it accelerated after the 1997-98 crisis, has been trade liberalisation and facilitation that affects the service link costs.

The mechanism of fragmentation was used to assist progressive planning of logistics and other economic infrastructure in the Asian region. For example, *Table 3* below illustrates policies for enhancing the '2nd unbundling' that is closely linked with ASEAN Economic Community Blueprint, ASEAN+1 FTAs and Master Plan of ASEAN Connectivity.

**Table 3: An Example of Policies for Enhancing the 2<sup>nd</sup> Unbundling**

	Reduction in network set-up cost	Reduction in service link cost	Reduction in production cost per se
High-level FTAs	Investment liberalisation IPR Protection Competition Policy	Tariff Removal Trade Facilitation Enhancing institutional connectivity	Liberalization of production-supporting services Investment liberalization
Development Agenda	Investment facilitation	Enhancing physical connectivity (including hard and soft logistics infrastructure development) Reducing transaction cost in economic activities	Upgrading infrastructure services such as electricity supply and EPZs Enhancing agglomeration effects through SME development Strengthening innovation

Source: Kimura, 2013<sup>13</sup>

## CURRENT STATE OF ASIAN INFRASTRUCTURE

### a) Physical/ Hard Infrastructure

While some Asian countries (like Singapore, Japan, South Korea) have good infrastructure, the region, in general, remains below the world average in terms of both quantity and quality (ADB 2007)<sup>14</sup> of infrastructure. As per the *Table 4* below, Asia's average lags in all categories of physical infrastructure as compared to OECD averages. For ASEAN, except for phones, all other categories lag behind that of Asian averages.

<sup>13</sup> 'Supply Chain Connectivity: Genesis and Concept', by Fukunari Kimura, at the ISEAS Symposium on 3 April 2013 in Singapore (<http://www.iseas.edu.sg/ISEAS/upload/files/Kimura.pdf>)

<sup>14</sup> Asian Development Bank, *ADB's Infrastructure Operations – Responding to Client Needs*. Manila: ADB, 2007.



**Table 4: Comparison in Infrastructure Coverage, 2008**

Item	Roads (km/1000 persons)	Rails (km/1000 persons)	Phones (number/ 1000 persons)	Electrification (percentage)	Clean Water (percentage)
ASEAN	10.51	0.27	3.53	71.69	86.39
Asia	12.83	0.53	3.47	77.71	87.72
OECD	211.67	5.21	13.87	99.80	99.63
Latin America	14.32	2.48	6.11	92.70	91.37
Africa	n.a.	0.95	1.42	28.50	58.36

Source: ADB, UNDP, and UNESCAP 2010, *Paths to 2015: MDG Priorities in Asia and the Pacific*.

Table 5 also explains the difference among the OECD and Asia-Pacific economies in terms of electric power consumption, mobile phone subscriptions and air passengers carried per capita. Except for mobile phone subscriptions for which most of the Asia-Pacific economies are catching up or have exceeded the OECD average, for the other two indicators, most of these countries remain below the OECD averages.

**Table 5: Comparison in Infrastructure Coverage**

Country	Electric Power Consumption (kWh per capita)	Mobile Cellular Subscriptions (per 100 people)	Air Passengers carried per capita
OECD	8281	103	1.35
Australia	10,177	101	2.03
Brunei	8,759	109.1	4.58
Cambodia	146	57.7	0.02
Canada	15,138	70.7	1.97
Chile	3,297	116	0.6
China	2,944	64	0.2

Country	Electric Power Consumption (kWh per capita)	Mobile Cellular Subscriptions (per 100 people)	Air Passengers carried per capita
Colombia	1,012	96.1	0.33
Ecuador	1,055	102.2	0.31
Hong Kong	5,923	195.6	3.59
India	616	61.4	0.05
Indonesia	641	88.1	0.15
Japan	8,394	97.4	0.74
Korea, Rep.	9,744	105.4	0.87
Lao PDR	--	64.6	0.1
Malaysia	4,117	119.2	0.92
Mexico	1,990	80.6	0.12
Mongolia	1,530	91.1	0.15
New Zealand	9,566	107.8	2.32
Papua New Guinea		27.8	0.17
Peru	1,106	100.1	0.21
Philippines	643	85.7	0.2
Russian Federation	6,452	166.3	0.4
Singapore	8,307	145.2	4.99
Thailand	2,243	103.6	0.29
United States	13,394	89.9	2.29
Vietnam	1,035	127	0.16

Source: Adapted from Pedrosa, 2013, PECC Secretariat<sup>15</sup>

<sup>15</sup> 'APEC and ASEAN Connectivity: Areas of Mutual Interest and Prospects of Cooperation' by Eduardo Pedrosa, at the ISEAS Symposium on 3 April 2013 in Singapore (<http://www.iseas.edu.sg/ISEAS/upload/files/Eduardo-Pedrosa-3-April.pdf>)

The quality of infrastructure in Asia is also much lower than that in developed nations. This can be observed broadly using the World Economic Forum's (WEF) Global Competitiveness Report 2008–2009 (*Table 6*).

**Table 6: Comparison of Asian Infrastructure Quality, 2008-09<sup>a, b</sup>**

Region	Overall Infrastructure	Road	Railroad	Port	Air Transport	Electricity Supply
World	3.8	3.8	3.0	4.0	4.7	4.6
G-7	5.7	5.7	5.4	5.4	5.8	6.4
East Asia	4.6	4.7	4.8	4.8	5.1	5.3
South Asia	2.9	3.1	2.8	3.4	4.2	2.8
ASEAN	4.2	4.2	3.2	4.3	5.1	4.7

Notes: Group of Seven (G7) countries include: Canada, France, Germany, Italy, Japan, United Kingdom, and United States

a In 2008-09, 134 countries have been surveyed; b Score: 1 = poorly developed and inefficient; 7 = among the best in the world.

Sources: Global Competitiveness Index, World Economic Forum, 2008

Thus, it could be said that although Asia has progressed in terms of infrastructure, it is yet to catch up with its dynamic economic growth and rising population. There is much room of improvement in Asian infrastructure, both in terms of quantity and quality.

#### *b) Soft Infrastructure/ Trade Facilitation*

Besides the physical infrastructure, other factors like trade facilitation, customs clearance and standards harmonisation also play an important role in reducing trade cost. For Asian economies, APEC and ASEAN regionalism processes are expected to play a role in this. But although tariff has been reduced under both, the progress on promoting trade facilitation has not been very impressive. In the case of ASEAN, the establishment of the ASEAN Single Window, Industrial Standards MRAs and ratification of transport agreements are all progressing slowly.

*Table 7 and 8* illustrate the wide gap in the standards of trade facilitation and institutional developments between the more developed economies (Singapore, Japan and Republic of Korea) and other countries in the region. This explains the

reason for concentration of production activities in limited locations in the region. In general, locations of foreign firms are strongly influenced by factors like the existence of intermediate goods, service providers, hard and soft infrastructure, human capital quality, and local market size<sup>16</sup>.

**Table 7: Trade Facilitation Indicators for Asia, 2006-09**

Country	Logistics Performance Index - Overall	UNCTAD - Liner shipping connectivity index	Mobile and fixed-line telephone subscribers (per 100 people)	Internet users (per 100 people)	Population covered by mobile cellular network (%)
Singapore	4.09	94.47	170.1	67.67	100
Malaysia	3.44	77.6	116.4	62.62	92.5
Thailand	3.29	36.48	128.5	20.03	37.77
Philippines	3.14	15.9	79.7	5.97	99
Vietnam	2.96	18.73	61.37	20.99	70
Indonesia	2.76	24.85	74.9	11.08	90
Lao PDR	2.46	..	25.82	1.64	..
Cambodia	2.37	3.47	29.13	0.48	87
Myanmar	2.33	3.63	2.01	0.08	10
Brunei	..	3.68	109.3	48.27	..
Japan	3.97	66.64	124.1	68.96	99.8
Rep. of Korea	3.64	76.4	137.7	77.1	89.77
China	3.49	137.4	69.25	22.48	97
India	3.12	42.18	33.75	7.2	60.9

Source: World Trade Indicators 2009/2010, The World Bank

<sup>16</sup> 'Production Networks and Regional Connectivity in ASEAN' by Aekapol Chongvilaivan at the ISEAS Symposium on 3 April 2013 in Singapore (<http://www.iseas.edu.sg/ISEAS/upload/files/Aekapol-Chongvilaivan.pdf>)

**Table 8: Indicators of Institutional Infrastructure in Asia, 2006-09**

Country	Government Effectiveness - WGI	Regulatory Quality - WGI	Rule of Law - WGI	Control of Corruption - WGI	Political Stability / Absence of Terrorism - WGI
Singapore	1	2	14	1	7
Malaysia	34	79	69	74	100
Brunei	42	47	66	56	13
Thailand	82	80	91	111	177
Philippines	91	96	121	148	182
Indonesia	108	110	144	137	170
Vietnam	111	137	117	150	86
Cambodia	163	131	176	184	131
Lao PDR	166	182	162	190	112
Myanmar	200	200	194	200	185
Japan	23	28	21	30	41
Rep. of Korea	29	53	51	60	79
China	74	108	110	117	134
India	95	106	86	110	168

Source: *World Trade Indicators 2009/2010, The World Bank*

This suggests that APEC and ASEAN need to give more attention to their trade facilitation process. It should be noted that intra-regional economic activities in Asia and the Pacific are likely to increase as both ASEAN and APEC have substantial developmental differences among its members and this offers opportunities to expand on the production networks.

Moreover, APEC and ASEAN are in the process of increasing economic activities among its member economies. ASEAN is working towards an economic community (AEC) by 2015 and it has also signed Free Trade Agreements with China, India, Korea and Japan. Concurrently, APEC, under its Bogor Goals, has agreed to achieve free trade and investment in the Asia-Pacific by 2010 for industrialized economies and 2020 for developing economies. All these can generate higher intra-regional trade and investment, thus creating pressures for trade facilitation so as to lower cost both in terms of time and money.

Acknowledging this, in 2010, the ASEAN leaders adopted the Master Plan on ASEAN Connectivity (MPAC), which looked at infrastructure development holisti-

cally i.e. physical connectivity, institutional connectivity and people-to-people connectivity. Similarly, in 2013, APEC is in the process of building its connectivity initiative and is developing it along the three dimensions of ASEAN connectivity.

## CONCLUSION

Asia has been leading the world economic growth for the past decade. One key strength of the Asian economies resides with the development of international production networks. This describes international division of labour not by industry, but by production process. As we observe fragmentation of the production process, particularly for the machinery industries, profitability depends on the cost of transporting intermediate goods across borders in terms of time and money. However, most of the Asian countries suffer from infrastructure deficiencies, and infrastructure quality varies across nations.

Thus, infrastructural connectivity – institutional, physical and people-to-people – becomes an imperative to further enhance the competitiveness of the Asian region. While institutional and people-to-people connectivity can be developed by high-level of free trade agreements, physical connectivity needs to be built with infrastructure development.

Realising this, ASEAN embarked on its connectivity project in 2010, when the regional Leaders adopted MPAC. Similarly, APEC, under Indonesia's chairmanship in 2013, has set connectivity as one of its priorities. What needs to be studied now is how these initiatives are finally getting implemented, since enhancing connectivity is not only about generating sufficient resources, but also about investing in people and technology. It should be noted that connectivity at this juncture is important for Asia so that it can remain the 'Factory of the World' and can continue to drive the global economic growth story.

\* \* \* \* \*

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