INFRASTRUCTURE FINANCING, PUBLIC-PRIVATE PARTNERSHIPS AND DEVELOPMENT IN THE ASIA-PACIFIC REGION

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Several studies have shown the significant interlinkage between infrastructure and development among various economies in the Asia-Pacific region. Recognizing the central role of infrastructure in contributing to the improvement of human welfare and achieving the 2030 Agenda for Sustainable Development, the present paper looks into the following key areas: (1) status of infrastructure in Asia-Pacific economies and infrastructure financing; (2) evidence linking infrastructure and development; (3) public-private partnership (PPP) as an emerging infrastructure financing scheme for developing economies; and (4) the creation of new financial institutions for infrastructure financing in the region. Overall, the Asia-Pacific region's large and expanding infrastructure needs may be addressed through various forms of financing. While tax revenues and borrowing will continue to be significant sources of financing for most economies in the region, PPPs and other emerging sources could play a major role in addressing infrastructure gaps.

JEL classification: H540, O180, O190.

Keywords: Infrastructure, sustainable development, official development assistance, public-private partnership, financial institutions, infrastructure financing.

I. INTRODUCTION

A cursory review of the state of infrastructure in Asia-Pacific economies shows the critical need to improve quality and accessibility to help foster more inclusive

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growth, especially in the developing economies of the region.[1] Infrastructure plays a key role in the 2030 Agenda for Sustainable Development, as it had done in achieving the Millennium Development Goals.

The present paper discusses infrastructure financing with emphasis on the public-private partnership (PPP) mode of financing, and financial institutions recently created for infrastructure financing. Data from 2005 onward are presented as most economies only began to report data on infrastructure and financing indicators in 2005. The exceptions are data for electrification and official development assistance (ODA). The paper presents some evidence linking infrastructure and development, and discusses PPP as an emerging infrastructure financing scheme for developing economies. It also reports on the establishment of new financial institutions for infrastructure financing. The final section gives concluding remarks.

II. STATUS OF INFRASTRUCTURE AND FINANCING MODALITIES

Infrastructure development in the region can be evaluated by looking at connectivity, access and quality indicators. Connectivity of citizens and firms within domestic economies can be gauged through domestic transport and information and communications technology (ICT) indicators while connectivity of domestic economies to the rest of the world is suggested by global transport indicators. The extent of access to basic infrastructure services is indicated by transport, ICT, water supply and electricity access indicators. Service level indicators using information from quality perception surveys measure infrastructure quality.[2] This section looks at infrastructure financing, basically ODA flows, which have supported infrastructure development in the region.

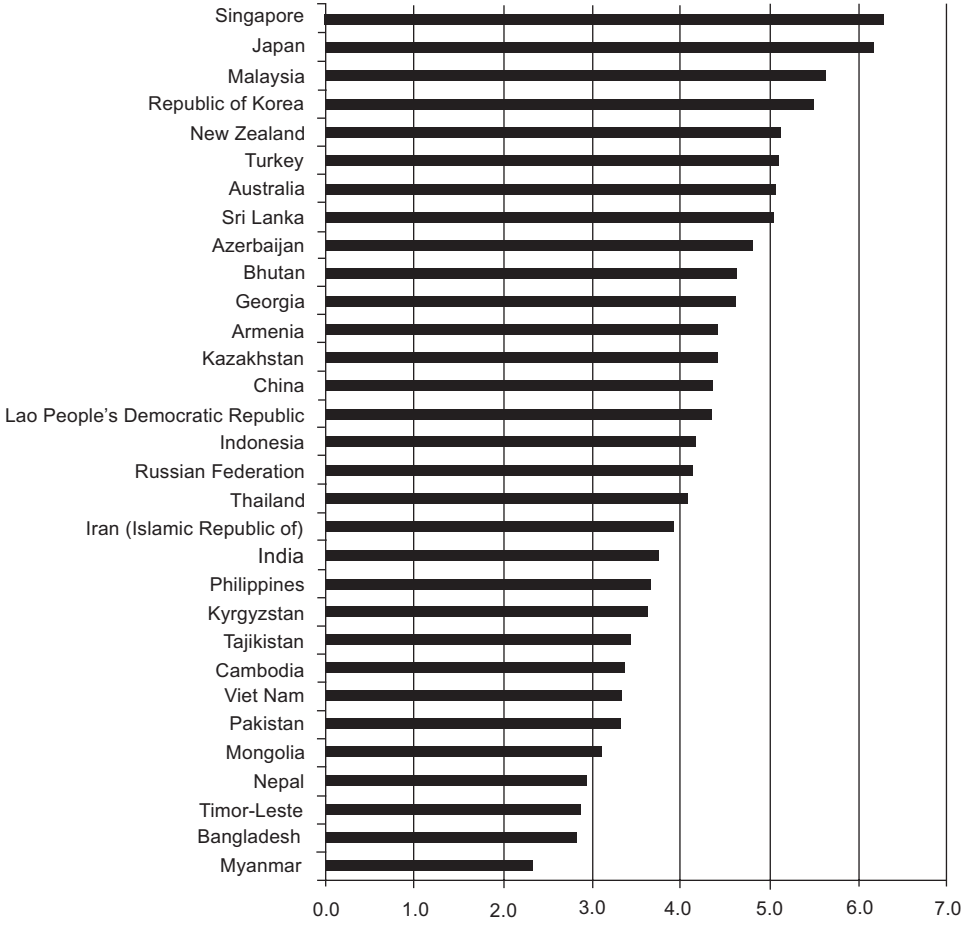
Status of infrastructure in the region

Data used in this section are the averages of experts' responses to the survey question "How would you assess general infrastructure, such as transport, telephony, and energy, in your country?" in the 2014 *Global Competitiveness Report.* Figure 1 depicts a summary of the overall perception on the quality of infrastructure in the region. The average score for the region is 4.3. The scores of sixteen developing economies and the Russian Federation are below this average.

[1] The economies of the Asia-Pacific region are those listed in the ESCAP *Statistical Yearbook for Asia and the Pacific*.

[2] Such as those conducted by the World Economic Forum for its annual *Global Competitiveness Report*.

Figure 1. Quality of overall infrastructure in Asia and the Pacific



Source: World Economic Forum (2014).

Note: 1 = extremely underdeveloped or among the worst in the world; 7 = extensive and efficient or among the best in the world.

Transportation[3]

Developing economies commonly have low road density. This is also the case for developed economies with large land areas, such as Australia and the Russian Federation. Information on road density does not adequately describe the population's level of access to roads. A more revealing indicator of this may be the availability of motor vehicles for the population. The average number of motor vehicles per 1,000 people for the region in 2011 was 220.67. Poor countries, such as Afghanistan, Myanmar, and Nepal, had less than 30 motor vehicles per 1,000 people. In developed economies that fell below this average, highly developed mass transport systems were substitutes for motor vehicle transport. Some economies, such as Brunei Darussalam and New Zealand, exhibited a negative rate of motorization during the period 2005-2011. Afghanistan, Bhutan, China and Kazakhstan had the highest growth of motorization.

During the period 2005-2011, vehicles per kilometer of road grew the most in China (16 per cent growth) and Kazakhstan (14 per cent growth) while in Japan they declined. Bhutan, Brunei Darussalam, Malaysia and Myanmar had the lowest vehicle density in the region (table 1).

In 2011, the region had an average paved road ratio of 71 per cent. Countries that fell below this average were Australia, Azerbaijan, Bhutan, China, India, Indonesia and Myanmar. The low paved road ratio in Australia and New Zealand may be explained by low population density in their respective rural areas (figure 2).

The quality of road transport infrastructure had an average score of 3.8, with 17 economies in the region falling below that score (figure 3).

The average score for quality of port infrastructure was 3.8. The scores of 14 developing economies was below the average (figure 4).

The average quality of air transport infrastructure was 4.3. The scores of 17 economies were below that average (figure 5). With respect to quality of rail transport infrastructure, 13 developing economies were below the average score of 3.5 (figure 6).

The liner shipping connectivity index shows wide disparity among Asia-Pacific economies (figure 7). This index (maximum value in 2004 = 100) indicates how well countries are connected to global shipping networks. In 2014, China had the highest index at 165 and the Federated States of Micronesia had the lowest.

[3] For transportation and the other infrastructure sectors, only those economies where data are available are included in determining the patterns and calculating averages.

Table 1. Transportation infrastructure indicators

Country/territory	Road density	AAGR (%)	Motor vehicles per 1 000 people, 2011	AAGR (%)	Vehicles per km of road	AAGR (%)
Afghanistan	..	..	29.29	13.70	..	..
Armenia	26.06	0.51	..	..	..	..
Australia	10.63	0.23 [a]	702.82	1.01	19.06	2.17 [a]
Azerbaijan	21.92	0.17	111.94	7.73	54.08	9.16
Bhutan	21.79	11.34	69.64	12.82	6.15	3.26
Brunei Darussalam	54.20	-1.51	355.22	-4.24	46.11	-0.95
China	42.77	3.48	68.94	19.49	22.57	16.06
Georgia	27.05	-1.25	165.65	7.37 [b]	39.41	9.43 [b]
Hong Kong, China	191.03	1.09	80.01	2.10	271.25	1.63
India	142.68	3.53	..	..	..	..
Indonesia	26.10	4.11	69.17	9.62	33.75	6.47
Iran (Islamic Republic of)	13.13	4.89	..	..	..	..
Japan	89.70	0.90	587.95	0.02	221.66	-0.86
Kazakhstan	3.57	1.13	245.57	13.36	41.85	13.78
Lao People's Democratic Republic	17.33	3.25	..	..	..	..
Macao, China	1 485.71	2.06	170.47	1.90	227.73	2.26
Malaysia	46.99	10.15	377.70	4.86	70.13	-3.19
Myanmar	5.58	3.92	7.25	4.02	9.27	0.81
Nepal	..	..	7.12	8.06 [a]	..	..
New Zealand	35.19	0.19	708.28	-0.13	33.12	0.75
Pakistan	32.98	0.28	20.20	7.78	13.60	9.44
Republic of Korea	106.04	0.54	370.38	2.48	174.05	2.45
Russian Federation	6.40	4.13	..	..	..	..
Singapore	480.56	0.63	151.07	0.77	229.51	3.17
Thailand	..	..	171.59	6.27	..	..
Turkey	47.26	0.98	163.80	4.80	32.58	5.13

Source: World Bank, World Development Indicators 2005-2011. Available from http://data.worldbank.org/data-catalog/world-development-indicators.

Notes: Road density is the number of kilometers of road per 100 square kilometer of land area. The road network consists of motorways, highways, main or national roads, secondary or regional roads, and other urban and rural roads.

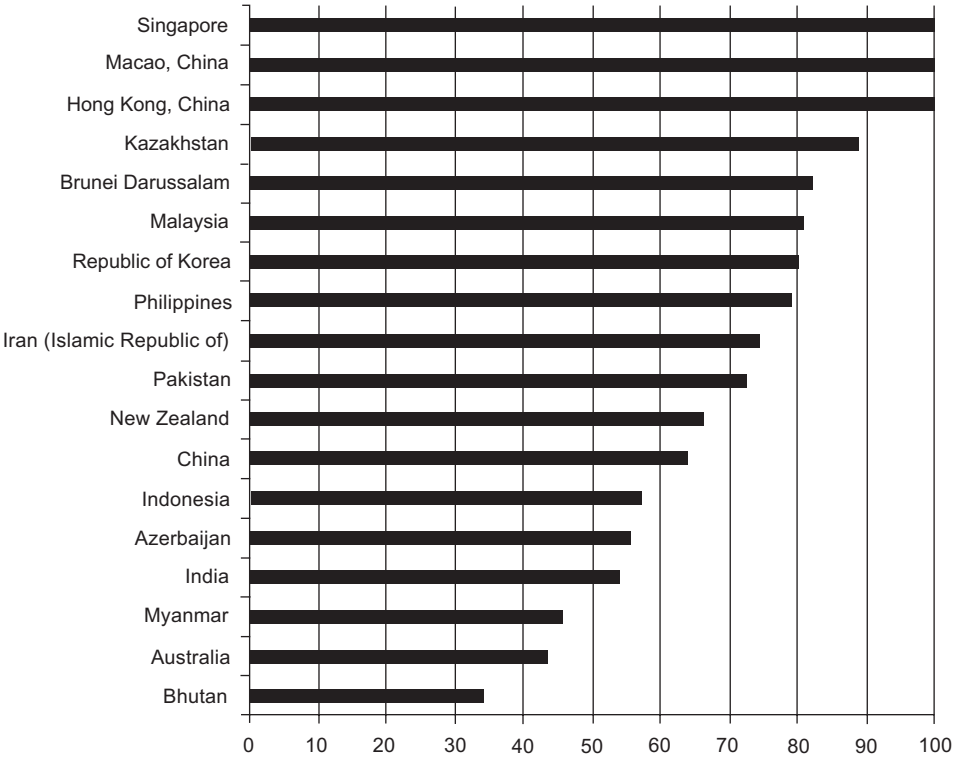
Motor vehicles include cars, buses, and freight vehicles, but do not include two-wheelers. Population refers to mid-year population in the year for which data are available.

[a] Covered period 2007-2011.

[b] Covered period 2006-2011.

AAGR – average annual growth rate from 2005 to 2011.

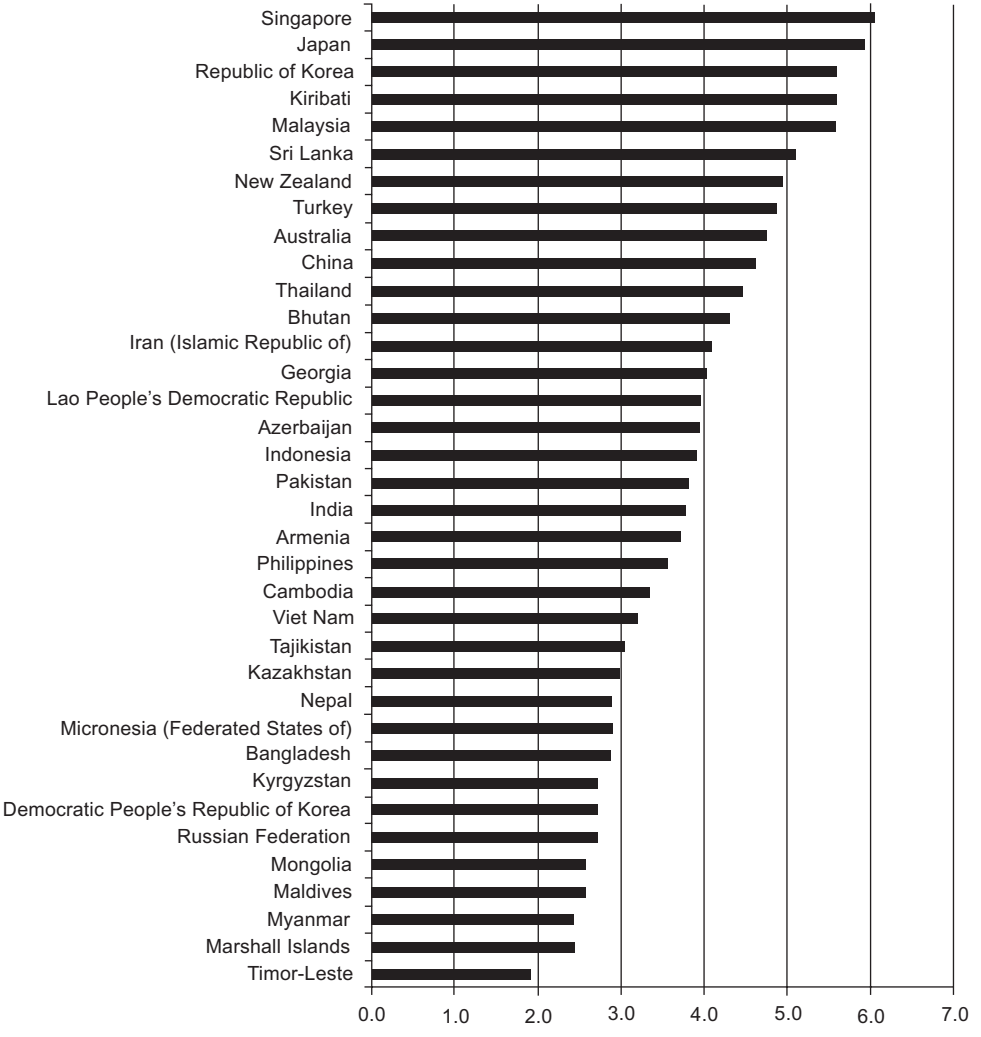
Figure 2. Paved roads as per cent of total roads in 2011



Source: World Bank, World Development Indicators 2011. Available from http://data.worldbank.org/data-catalog/world-development-indicators.

Note: Paved road ratio is defined as paved roads (those surfaced with crushed stone (macadam), hydrocarbon binder or bituminized agents, concrete or cobblestones) as a percentage of total roads, measured in kilometers. For the Philippines, government data are used.

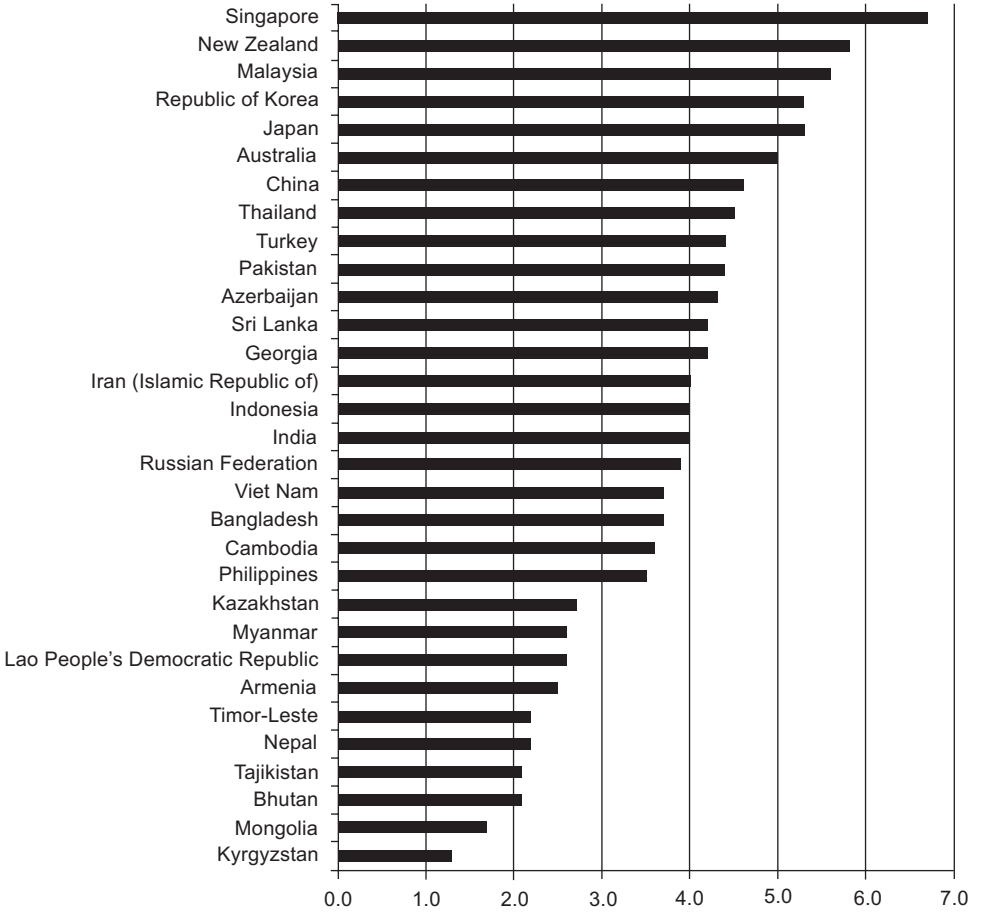
Figure 3. Quality of road transport infrastructure in Asia and the Pacific



Source: World Economic Forum (2014).

Note: Quality of roads: 1 = extremely underdeveloped or among the worst in the world; 7 = extensive and efficient or among the best in the world.

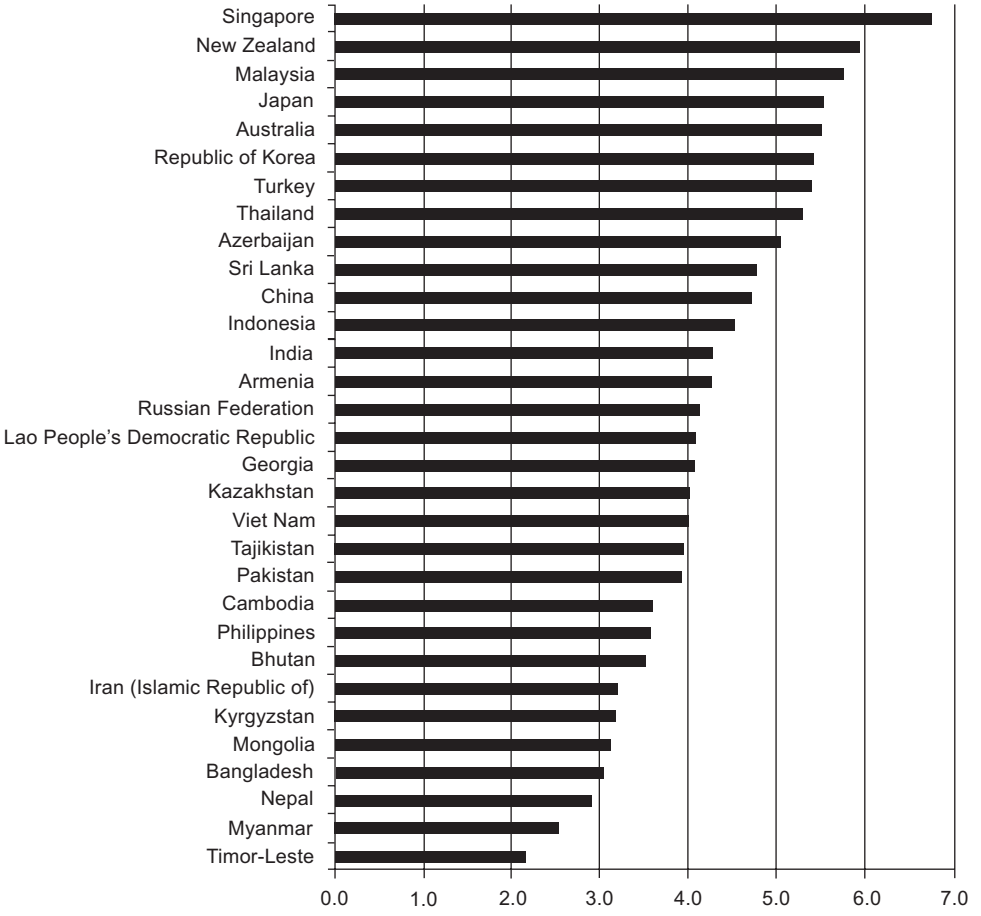
Figure 4. Quality of port infrastructure in Asia and the Pacific



Source: World Economic Forum (2014).

Note: Quality of port infrastructure: 1 = extremely underdeveloped or among the worst in the world; 7 = extensive and efficient or among the best in the world.

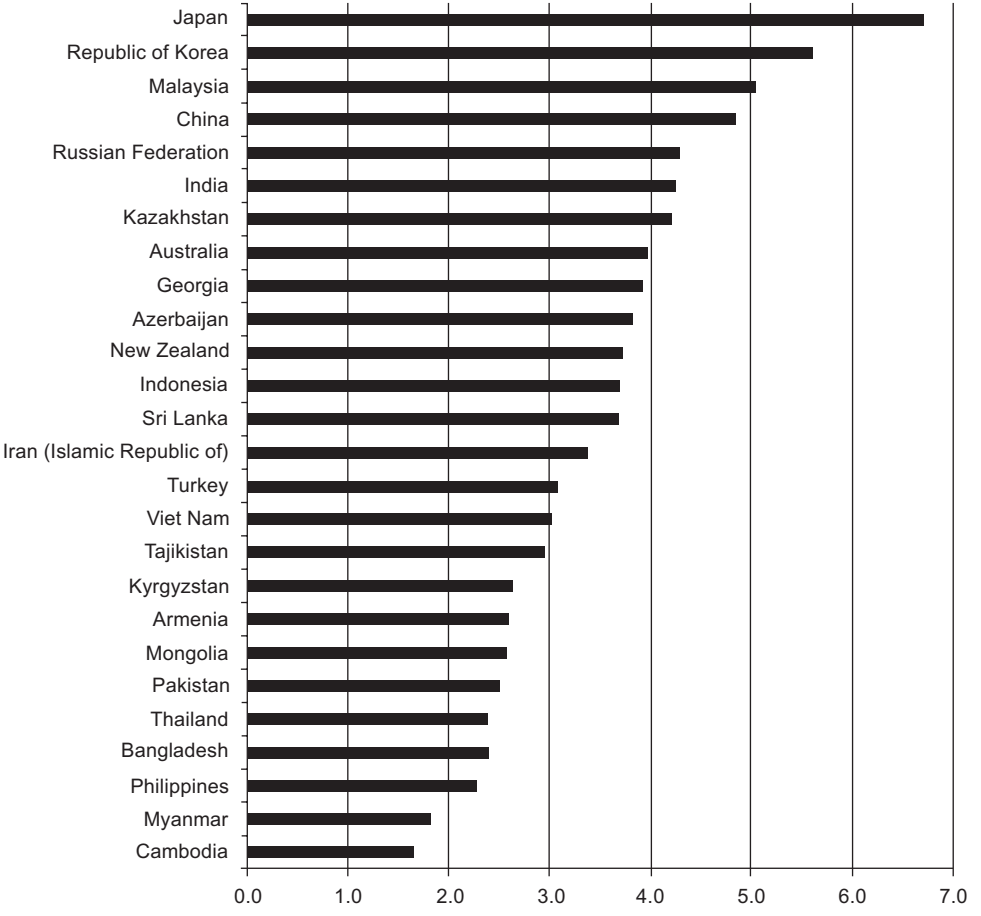
Figure 5. Quality of air transport infrastructure in Asia and the Pacific



Source: World Economic Forum (2014).

Note: Quality of air transport infrastructure: 1 = extremely underdeveloped or among the worst in the world; 7 = extensive and efficient or among the best in the world.

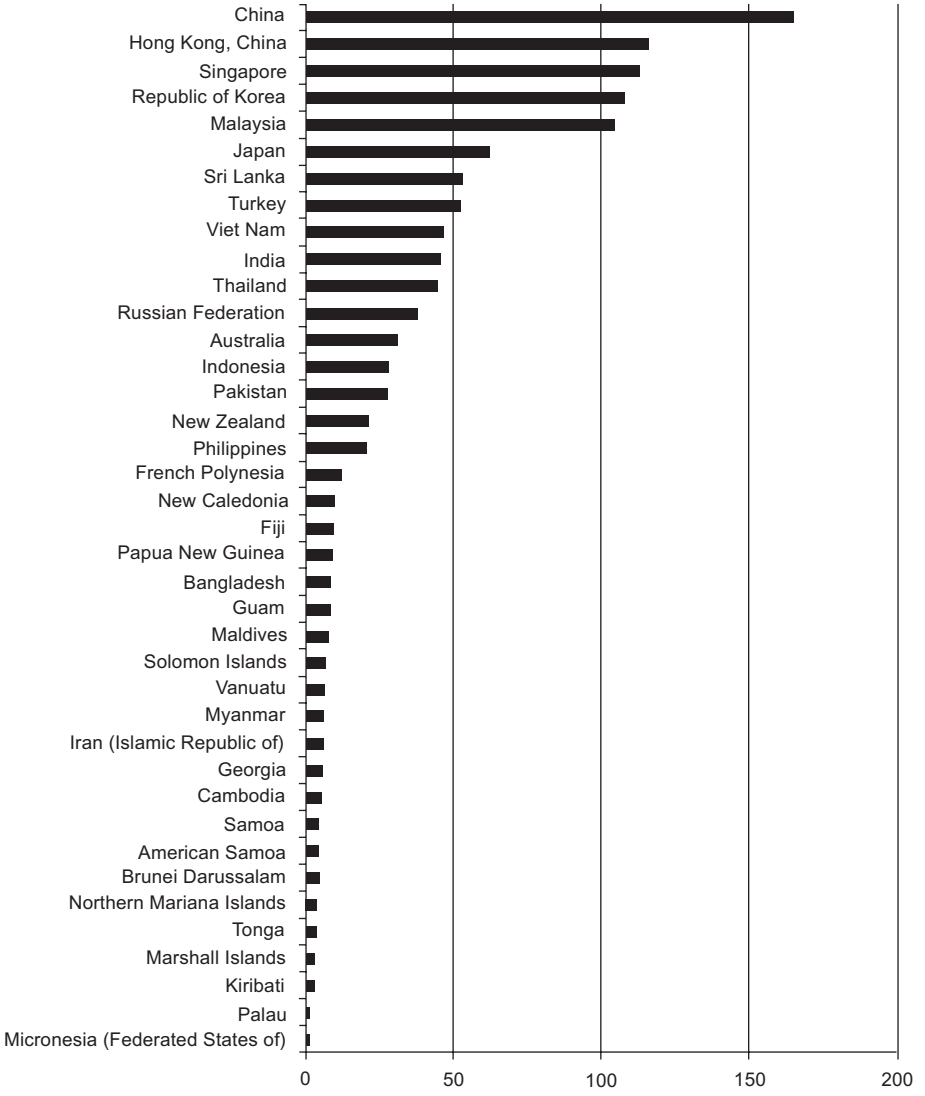
Figure 6. Quality of rail transport infrastructure in Asia and the Pacific



Source: World Economic Forum (2014).

Note: Quality of railroad infrastructure: 1 = extremely underdeveloped or among the worst in the world; 7 = extensive and efficient or among the best in the world.

Figure 7. Liner shipping connectivity index in Asia and the Pacific



Source: World Bank, World Development Indicators 2014. Available from http://data.worldbank.org/data-catalog/world-development-indicators.

Note: The United Nations Conference on Trade and Development computes the index based on five components of the maritime transport sector: number of ships; their container-carrying capacity; maximum vessel size; number of services; and number of companies that deploy container ships in a country's ports.

Information and communications technology

Data show a wide digital divide among the population with many developing economies below the average of the access indicators. Those economies are in a catch-up mode (table 2).

Table 2. Information and communications technology indicators in Asia and the Pacific

Country/territory	Telephone lines per 100 people	AAGR (%)	Mobile cellular subscriptions per 100 people	AAGR (%)	Fixed broadband Internet subscribers per 100 people	AAGR (%)
Afghanistan	0.31	102.85 [a]	70.66	39.86	5.90	21.72
American Samoa	18.13	0.38	..	..	..	..
Armenia	19.43	-0.18	112.42	34.42	46.30	31.26
Australia	44.34	-1.32	106.84	2.20	83.00	3.51
Azerbaijan	18.67	4.86	107.61	19.33	58.70	28.23
Bangladesh	0.69	-0.98	74.43	36.19	6.50	50.91
Bhutan	3.51	-4.49	72.20	37.86	29.90	29.22
Brunei Darussalam	13.58	-6.28	112.21	7.41	64.50	7.39
Cambodia	2.78	35.35	133.89	42.33	6.00	44.40
China	19.27	-3.94	88.71	14.59	45.80	23.39
Democratic People's Republic of Korea	4.74	1.52	9.72	141.84 [a]	..	..
Fiji	7.97	-6.53	105.60	19.78	37.10	20.31
French Polynesia	19.87	-0.66	85.58	7.76	56.80	12.88
Georgia	27.65	10.17	115.03	20.29	43.10	27.74
Guam	40.58	-0.24	..	..	65.40	6.83
Hong Kong, China	63.11	1.74	237.35	8.47	74.20	3.37
India	2.32	-7.83	70.78	31.33	15.10	25.93
Indonesia	12.30	9.34	125.36	25.10	15.82	20.32
Iran (Islamic Republic of)	38.33	3.55	84.25	27.41	31.40	18.46
Japan	47.99	0.61	117.63	5.61	86.25	3.22
Kazakhstan	26.71	5.08	184.69	22.75	54.00	43.75
Kiribati	8.79	8.31	16.61	48.08	11.50	14.11
Kyrgyzstan	8.31	-0.61	121.45	35.41	23.40	10.49

Table 2. *(continued)*

Country/territory	Telephone lines per 100 people	AAGR (%)	Mobile cellular subscriptions per 100 people	AAGR (%)	Fixed broadband Internet subscribers per 100 people	AAGR (%)
Lao People's Democratic Republic	10.37	26.63	68.14	25.10	12.50	39.93
Macao, China	27.97	-3.52	304.08	13.07	65.80	8.26
Malaysia	15.26	-1.26	144.69	8.45	66.97	4.08
Maldives	6.54	-6.14	181.19	12.94	44.10	26.16
Marshall Islands	..	..	..	..	11.70	14.80
Micronesia (Federated States of)	9.70	-2.34	30.32	10.88	27.80	11.21
Mongolia	6.19	0.02	124.18	24.11	17.70	11.93 [c]
Myanmar	1.00	0.00	12.83	63.08	1.20	43.91
Nepal	2.98	5.69	76.85	74.38	13.30	41.52
New Caledonia	33.14	4.02	93.76	6.03	66.00	9.32
New Zealand	41.06	-0.23	105.78	2.71	82.78	3.53
Northern Mariana Islands	42.71	2.09	..	..	..	..
Pakistan	3.50	0.69	70.13	31.00	10.90	7.02
Palau	34.72	-1.78	85.79	13.85	..	..
Papua New Guinea	1.91	7.84	40.98	54.99	6.50	18.11
Philippines	3.20	-2.52	104.50	12.57	37.00	27.20
Republic of Korea	61.57	2.43	111.00	3.93	84.77	1.80
Russian Federation	28.34	0.21	152.84	7.87	61.40	19.04
Samoa	..	..	..	..	15.30	20.90
Singapore	36.35	-1.50	155.92	6.04	73.00	2.27
Solomon Islands	1.36	-1.87	57.57	60.95	8.00	32.46
Sri Lanka	12.72	9.33	95.50	24.21	21.90	36.74
Tajikistan	5.18	2.91	91.83	48.45	16.00	64.48
Thailand	9.04	-2.12	140.05	14.79	28.94	8.54
Timor-Leste	0.26	1.54	57.38	42.78	1.10	35.11
Tonga	29.43	10.12	54.59	7.96	35.00	27.83
Turkey	18.09	-5.32	92.96	4.70	46.25	14.68
Turkmenistan	11.49	4.01	116.89	64.21	9.60	32.72
Tuvalu	14.68	6.04	34.43	12.51	37.00	24.37 [c]
Uzbekistan	6.91	0.05	74.31	50.90	38.20	35.59

Table 2. *(continued)*

Country/territory	Telephone lines per 100 people	AAGR (%)	Mobile cellular subscriptions per 100 people	AAGR (%)	Fixed broadband Internet subscribers per 100 people	AAGR (%)
Vanuatu	2.17	-5.17	50.34	30.29	11.30	10.50
Viet Nam	10.13	0.20 [b]	130.89	35.84	43.90	16.72

Source: World Bank, World Development Indicators 2013. Available from http://data.worldbank.org/data-catalog/world-development-indicators.

Notes: Telephone lines are fixed telephone lines that connect a subscriber's terminal equipment to the public switched telephone network and have a port on a telephone exchange. Integrated services digital network channels and fixed wireless subscribers are included in this category. Mobile cellular telephone subscriptions are subscriptions to a public mobile telephone service using cellular technology, which provides access to the public switched telephone network. Post-paid and prepaid subscriptions are included.

Fixed broadband Internet subscribers are the number of broadband subscribers with a digital subscriber line, cable modem or other high-speed technology.

[a] Covered period 2009-2013.

[b] Covered period, 2006-2013.

[c] Covered period 2007-2013.

AAGR – average annual growth rate from 2005 to 2013.

Regarding telephone density, 31 economies were below the regional average of 17.69 telephone lines per 100 people in 2013. From 2005 to 2013, Cambodia and the Lao People's Democratic Republic exhibited high average annual growth rates of 35 per cent and 27 per cent, respectively. The region had an average of 100.25 mobile cellular subscriptions per 100 people in 2013, with twenty-six economies falling below this average. The mobile density growth of many developed economies was low because their high mobile cellular density was already high to begin with. Most developing economies had experienced high mobile cellular density growth.

The average fixed broadband Internet subscription for the region was 36.4 subscriptions per 100 people in 2013; 26 economies were below this average. Most economies had experienced high broadband growth.

Electricity

Per capita electric power consumption in the region was 3,286.25 kWh in 2011, with 22 economies having consumption levels below this average. The economies with the highest average annual consumption growth, such as Cambodia, 16 per cent

and China, 11 per cent, also experienced high economic growth in the period considered (table 3).

Seven economies had low access to electricity (75 per cent of households) in 2012. The Democratic People's Republic of Korea had the lowest electrification rate in the region.

Table 3. Energy infrastructure indicators in Asia and the Pacific

Country	Electric power consumption (kWh per capita), 2011	AAGR (%)	Electricity access (% of population), 2012
Armenia	1 754.65	2.60	..
Australia	10 712.18	0.40	..
Azerbaijan	1 705.42	-5.46	..
Bangladesh	258.62	7.13	60.0
Brunei Darussalam	8 506.51	0.21	100.0
Cambodia	164.39	16.33	34.0
China	3 297.97	10.78	100.0
Democratic People's Republic of Korea	739.34	-1.51	26.0
Georgia	1 917.99	1.88	..
India	684.11	6.80	75.0
Indonesia	679.70	5.11	76.0
Iran (Islamic Republic of)	2 648.84	4.21	..
Japan	7 847.80	-0.75	..
Kazakhstan	4 892.91	3.36	..
Kyrgyzstan	1 641.64	1.07	..
Lao People's Democratic Republic	..	..	78.0
Malaysia	4 246.47	6.83	100.0
Mongolia	1 576.86	3.42	90.0
Myanmar	110.24	7.11	32.0
Nepal	105.50	5.06	76.0
New Zealand	9 398.67	-0.48	..
Pakistan	449.25	-0.02	69.0
Philippines	646.96	1.85	70.0
Republic of Korea	10 161.95	4.50	..

Table 3. *(continued)*

Country	Electric power consumption (kWh per capita), 2011	AAGR (%)	Electricity access (% of population), 2012
Russian Federation	6 485.96	1.92	..
Singapore	8 404.23	-0.20	100.0
Sri Lanka	490.25	3.53	89.0
Tajikistan	1 713.79	-3.67	..
Thailand	2 315.99	3.26	99.0
Turkey	2 709.26	5.03	..
Turkmenistan	2 443.86	2.93	..
Uzbekistan	1 625.97	-0.85	..
Viet Nam	1 073.28	10.80	96.0

Sources: Electric power consumption extracted from World Bank, World Development Indicators 2011. Available from http://data.worldbank.org/data-catalog/world-development-indicators; and Electricity access data from International Energy Agency (2014).

Notes: Electric power consumption measures the production of power plants and combined heat and power plants less transmission, distribution, and transformation losses and own use by heat and power plants.

Access to electricity is the percentage of population with access to electricity.

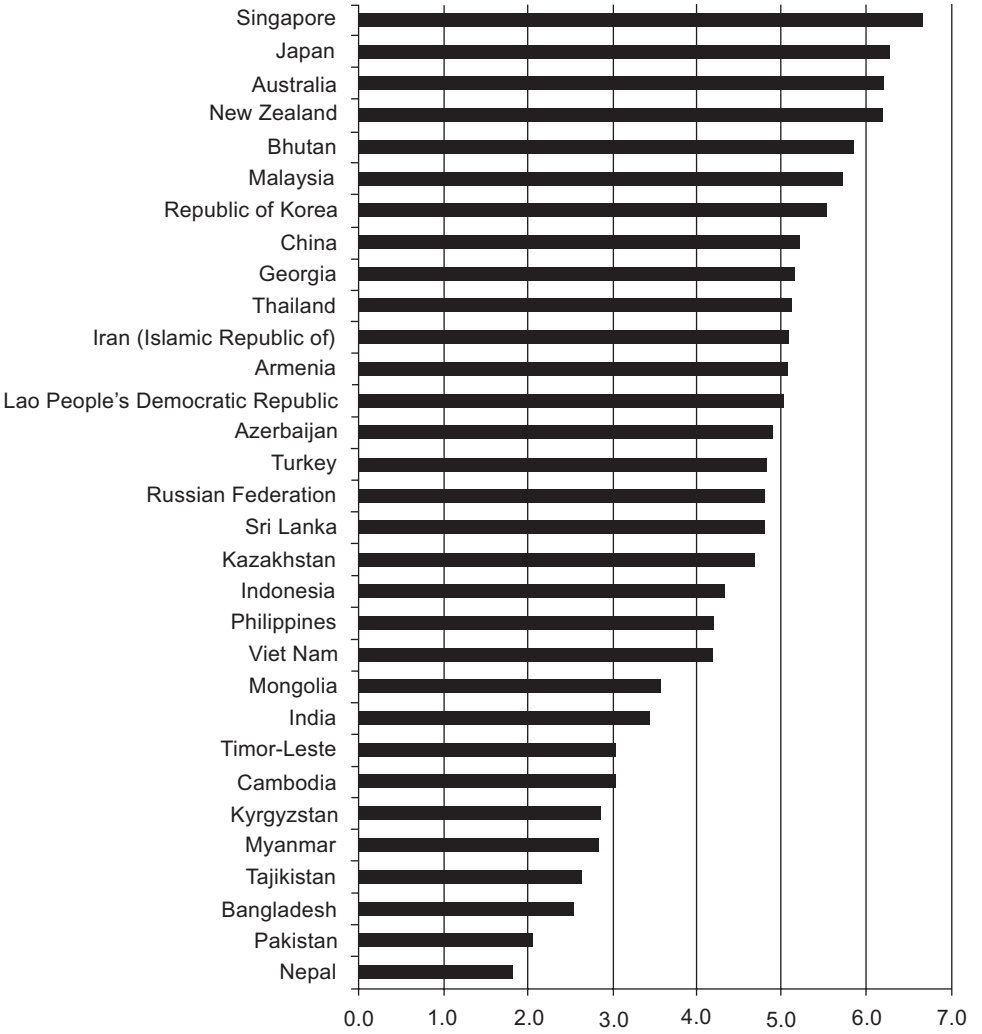
AAGR – average annual growth rate, 2005 to 2011.

On the quality of electricity supply, in 2014, the average reliability score for the region was 4.5. Thirteen economies scored below this average, with Nepal recording the lowest score (figure 8).

Water and sanitation

In 2012, access to improved water sources in eight economies remained very low, with three or more people for every ten people without access. The worst case was Papua New Guinea, where six of ten people did not have access to an improved water source (table 4). In 2012, twenty economies had very low access (three or four people) to improved sanitation facilities. Only 18.7 per cent of the population of Papua New Guinea had access to improved sanitation facilities (table 4).

Figure 8. Quality of electricity supply in Asia and the Pacific



Source: World Economic Forum (2014).

Note: Quality of electricity supply: 1 = not reliable at all; 7 = extremely reliable.

Table 4. Water and sanitation infrastructure indicators in Asia and the Pacific

Country	Improved water source (% of population with access)	Improved sanitation facilities (% of population with access)
Afghanistan	64.2	29.0
American Samoa	100.0	62.5
Armenia	99.8	90.5
Australia	100.0	100.0
Azerbaijan	80.2	82.0
Bangladesh	84.8	57.0
Bhutan	98.1	46.9
Cambodia	71.3	36.8
China	91.9	65.3
Democratic People's Republic of Korea	98.1	81.8
Fiji	96.3	87.2
French Polynesia	100.0	97.1
Georgia	98.7	93.3
Guam	99.5	89.8
India	92.6	36.0
Indonesia	84.9	58.8
Iran (Islamic Republic of)	95.9	89.4
Japan	100.0	100.0
Kazakhstan	93.1	97.5
Kiribati	66.8	39.7
Kyrgyzstan	87.6	91.8
Lao People's Democratic Republic	71.5	64.6
Malaysia	99.6	95.7
Maldives	98.6	98.7
Marshall Islands	94.5	76.2
Micronesia (Federated States of)	89.0	57.2
Mongolia	84.6	56.2
Myanmar	85.7	77.4
Nepal	88.1	36.7
New Caledonia	98.5	100.0
New Zealand	100.0	79.7

Table 4. *(continued)*

Country	Improved water source (% of population with access)	Improved sanitation facilities (% of population with access)
Northern Mariana Islands	97.5	47.6
Pakistan	91.4	100.0
Papua New Guinea	39.7	18.7
Philippines	91.8	74.3
Republic of Korea	97.8	100.0
Russian Federation	97.0	70.5
Samoa	98.5	91.6
Singapore	100.0	100.0
Solomon Islands	80.5	28.8
Sri Lanka	93.8	92.3
Tajikistan	71.7	94.4
Thailand	95.8	93.4
Timor-Leste	70.5	38.9
Tonga	99.3	91.3
Turkey	99.7	91.2
Turkmenistan	71.1	99.1
Tuvalu	97.7	83.3
Uzbekistan	87.3	100.0
Vanuatu	90.7	57.9
Viet Nam	95.0	75.0

Source: World Bank, World Development Indicators 2012. Available from http://data.worldbank.org/data-catalog/world-development-indicators.

Notes: Access to an improved water source refers to the percentage of the population using an improved drinking water source. The improved drinking water source includes piped water on premises (piped household water connection located inside the user's dwelling, plot or yard), and other improved drinking water sources (public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs and rainwater collection).

Access to improved sanitation facilities refers to the percentage of the population using improved sanitation facilities. The improved sanitation facilities include flush/pour flush (to piped sewer system, septic tank or pit latrine), ventilated improved pit latrine, pit latrine with slab, and composting toilet.

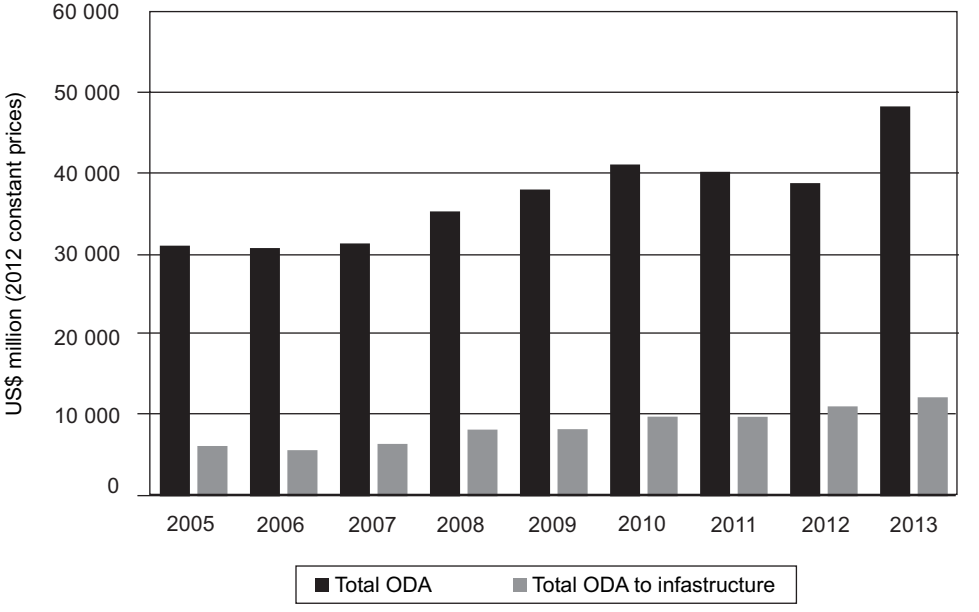
Overseas development aid for infrastructure financing in the region

This section covers only overseas development aid (ODA) financing because of severe data limitations. Domestic public resources used for infrastructure are not covered in this discussion due to very limited data for many ESCAP economies.

Overseas development aid is defined[4] as grants or loans undertaken by the official sector with promotion of economic development and welfare as the main objective and at concessional financial terms (if in the form of a loan, having a grant element of at least 25 per cent). This definition does not include grants, loans and credits for military purposes and transfer payments to private individuals, such as pensions, reparations, or insurance payments.

The share of ODA directed to infrastructure to total ODA was about 23 per cent during the period 2005-2013. Annual shares ranged between 19 and 29 per cent (figure 9). Over the period 2005-2013, ODA to infrastructure with an average annual

Figure 9. Total overseas development aid and overseas development aid to infrastructure



Source: OECD (2005-2013).

[4] The definition is from the Development Assistance Committee of the Organisation for Economic Co-operation and Development (OECD).

growth rate of 9 per cent outpaced overall ODA average annual growth rate of 6 per cent. ODA directed to the water and sanitation sector grew rapidly during this period (table 5).

Global commitments to meet the Millennium Development Goals helped channel more ODA to water and sanitation. ODA to the communications sector declined during the period 2005-2013 because of extensive private funds flow to the sector, fueled by rising demand, rapid technological advancements and privatization.

Table 5. Growth of overseas development aid to infrastructure in Asia and the Pacific

	Average annual growth, 2005-2013
Water and sanitation	10%
Transport and storage	9%
Communications	-3%
Energy	8%
Total	9%

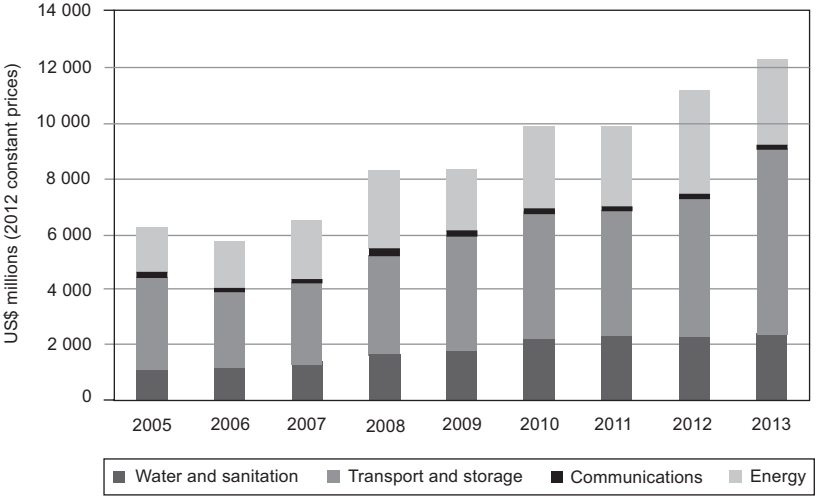
Source: OECD (2005-2013).

The composition of ODA flows to infrastructure was stable with the transport and storage sector experiencing the highest annual share of 47 per cent during the period of 2005-2013, followed by energy (29 per cent), and water and sanitation (21 per cent). Figure 10 shows the ODA flows directed to infrastructure, while figure 11 shows the yearly sectoral composition in 2005-2013.

Most ODA flows are coursed to the public sector but some are channeled to PPPs, albeit in relatively small amounts (0.1 per cent). The annual growth rate of ODA flows to PPPs was high, at 14 per cent, during the period 2006 to 2013. ODA flows directed to PPPs initially were mostly for water and sanitation, but subsequently, other sectors were also covered (figures 12 and 13). This implies collaboration among donors, governments and the private sector in addressing infrastructure needs in the region.

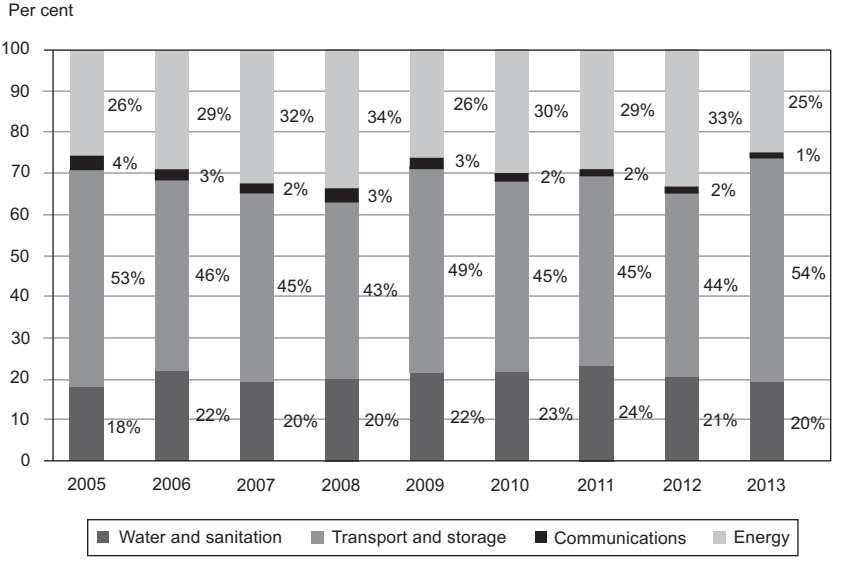
The Asian Development Bank (ADB) has served as a major source of finance for infrastructure. In 2013, about 66 per cent of ADB loans were for infrastructure, with loans for transport and ICT the largest, at 34.9 per cent of the total, followed by loans for energy, at 21.7 per cent, and loans for water and others, at 8.7 per cent.

Figure 10. ODA flows to infrastrucure, 2005-2013



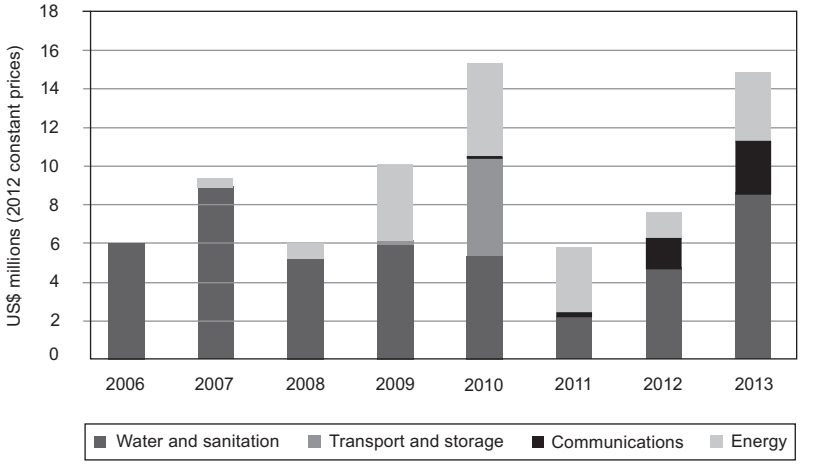
Source: OECD (2005-2013).

Figure 11. Sectoral composition of overseas development aid flows to infrastructure



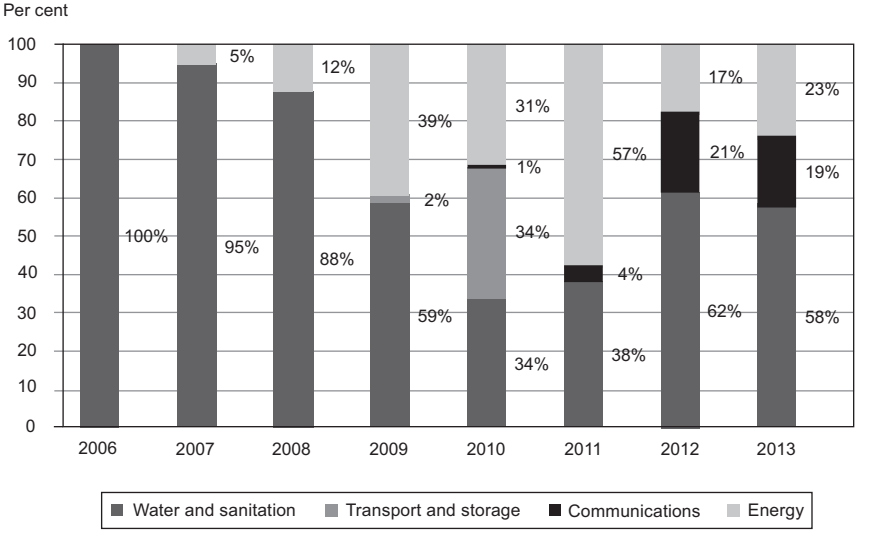
Source: OECD (2005-2013).

Figure 12. Overseas development aid flows to public-private partners in Asia and the Pacific



Source: OECD (2005-2013).

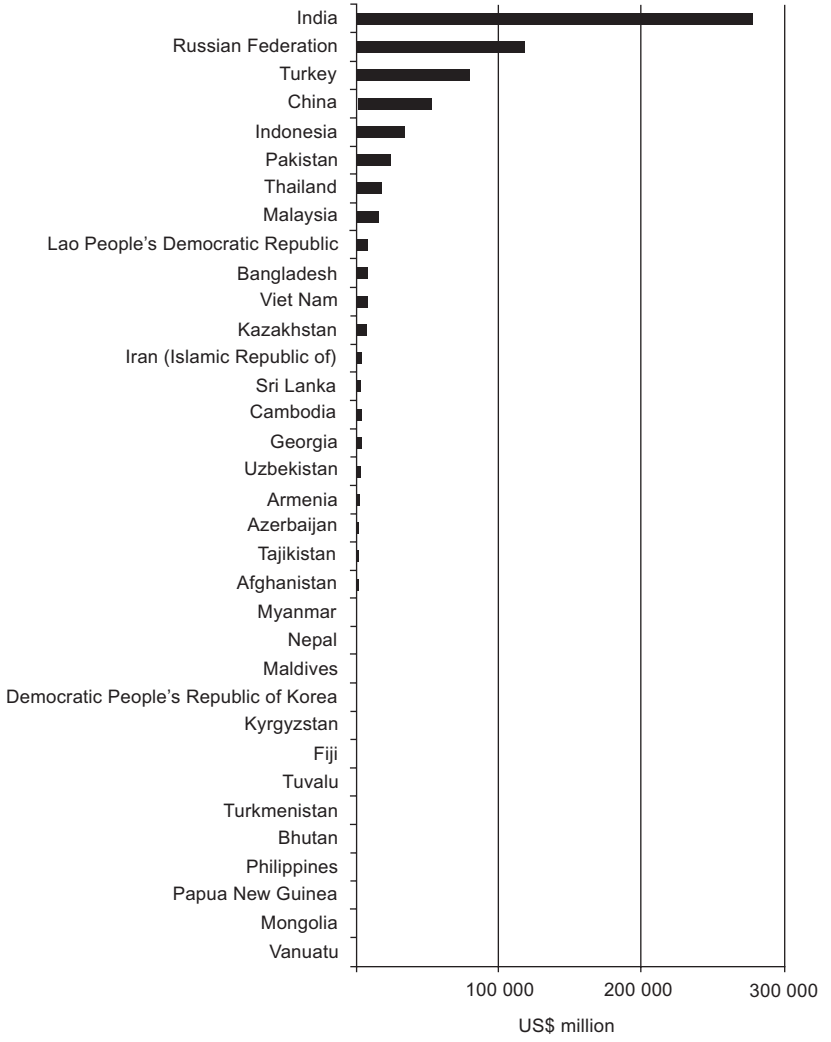
Figure 13. Sectoral composition of overseas development aid flows to public private partnerships in Asia and the Pacific



Source: OECD (2005-2013).

During the period 2005-2013, India was very successful in attracting private investments in infrastructure, followed by the Russian Federation and Turkey while PPP investments in infrastructure in most developing economies were insignificant (figure 14, table 7).

Figure 14. Infrastructure investments with private participation in Asia and the Pacific, 2005-2013



Source: World Bank (2005-2013).

Table 7. Trends in infrastructure investments with private participation in Asia and the Pacific

Country	2005-2009	2010-2013	Total
India	118 279	159 542	277 821
Russian Federation	59 401	58 399	117 800
Turkey	35 248	44 666	79 914
China	36 375	15 869	52 244
Indonesia	18 136	15 411	33 547
Pakistan	19 637	4 466	24 103
Thailand	8 458	9 567	18 025
Malaysia	7 176	8 052	15 228
Lao People's Democratic Republic	3 337	4 813	8 150
Bangladesh	4 535	3 457	7 992
Viet Nam	3 630	4 313	7 943
Kazakhstan	3 940	3 051	6 991
Iran (Islamic Republic of)	2 014	1 596	3 610
Sri Lanka	1 626	1 756	3 382
Cambodia	1 432	1 893	3 325
Georgia	2 468	685	3 153
Uzbekistan	1 520	1 589	3 109
Armenia	1 741	480	2 221
Azerbaijan	1 407	319	1 726
Tajikistan	1 080	320	1 400
Afghanistan	1 211	176	1 387
Myanmar	556	170	726
Nepal	289	412	701
Maldives	49	514	563
Democratic People's Republic of Korea	427	47	474
Kyrgyzstan	138	135	273
Fiji	173	72	245
Bhutan	219	..	219
Turkmenistan	158	61	219
Tuvalu	158	61	219
Papua New Guinea	150	..	150
Philippines	150	..	150
Mongolia	..	120	120
Vanuatu	41	..	41

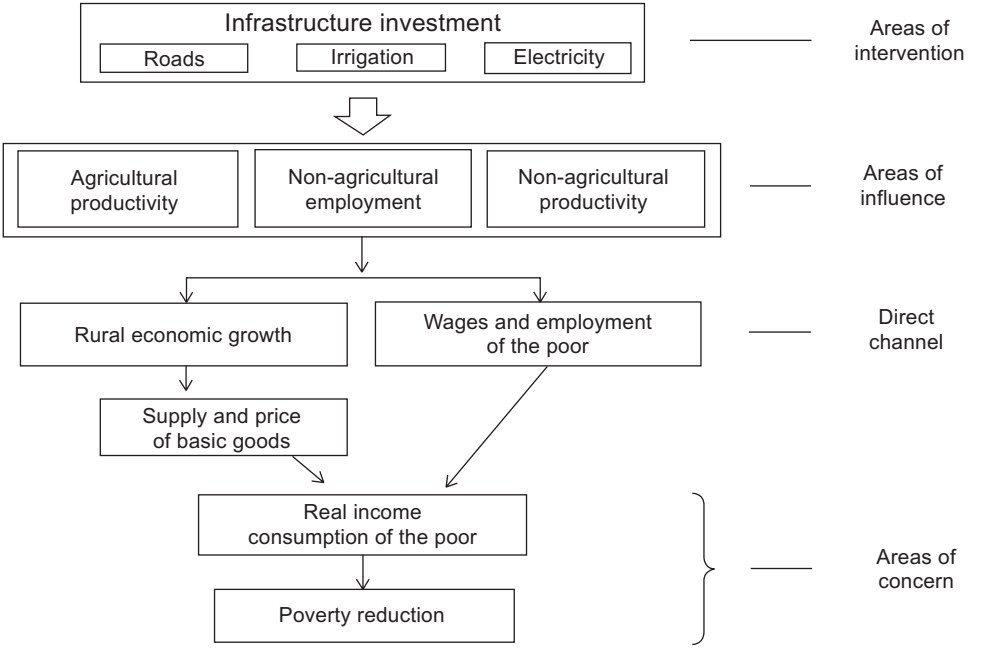
Source: World Bank (2005-2013).

III. DEVELOPMENT, INFRASTRUCTURE AND FINANCING MODALITIES

Infrastructure, growth and poverty reduction

The literature confirms the close link between infrastructure development, growth, and poverty reduction. Sahoo, Dash and Nataraj (2010) found unidirectional causality from infrastructure development to output growth from 1975 to 2007. Infrastructure has substantial impacts on growth that may vary across countries, time, and within infrastructure subsectors (Dissou and Didic, 2013, p. 42; Estachea and Garsous, 2012, among others). Infrastructure positively affects growth by increasing labour productivity and reducing transaction costs, while investments in roads and irrigation infrastructure contribute positively to economic growth and poverty reduction (figure 15).

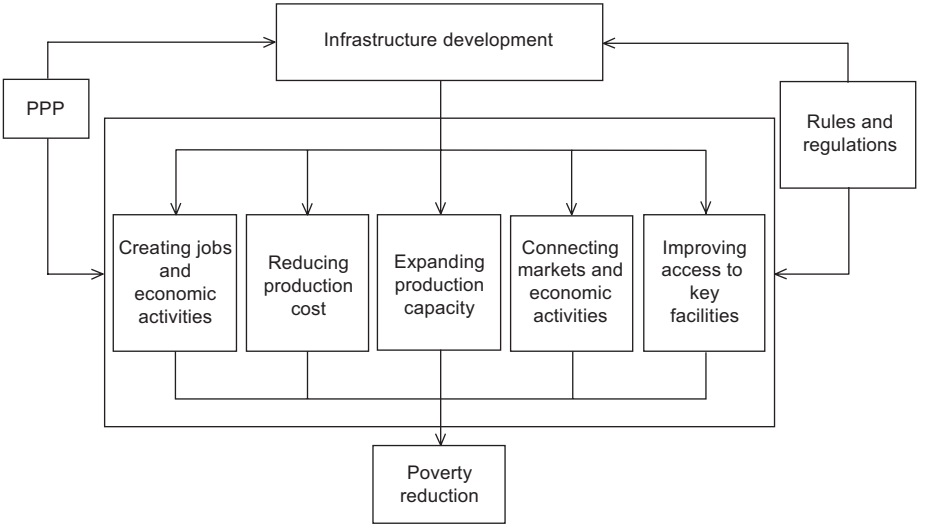
Figure 15. Links between infrastructure and poverty reduction



Source: Ali and Pernia (2003).

A long-term positive impact on growth may be obtained from investments in power and telecommunications (Egert, Kozluk and Sutherland, 2009). In China, sustained high economic growth is largely attributed to the massive investments in physical infrastructure starting in the early 1990s. Llanto (2013) shows the positive impacts of infrastructure on Philippine agricultural productivity. The Philippine regions with higher infrastructure investments have experienced higher economic growth. Studies indicate that quality infrastructure serves as the backbone of a strong economy and a significant factor for reducing poverty. Jones (2004) found compelling evidence that investments in water, sanitation and roads were critical to growth and have benefited the poor in East Asia and the Pacific. Lack of essential infrastructure, such as water, transportation, housing, and energy, hinders inclusive growth and poverty reduction (Geest and Nunez-Ferrer, 2011). Figure 16 illustrates how infrastructure development leads to poverty reduction.[5]

Figure 16. Framework on infrastructure for inclusive growth and poverty reduction



Source: ADB (2012c).

Note: PPP = public-private partnership.

[5] In this framework, PPPs are included as a mechanism to provide infrastructure.

Infrastructure needs in the Asia-Pacific region

Infrastructure development in Asia has greatly contributed to a decrease in the number of poor people from 903.4 million in 2005 to 754 million in 2008,[6] and the rapid increase in gross domestic product (GDP) per capita from $2,490 in 2000 to $5,489 in 2009 (ADB, 2012b). Infrastructure investments have resulted in substantial improvement in human development in the region.

The Asian Development Bank has noted that Asia needs to raise approximately $8 trillion in overall national infrastructure funding for the period 2010 to 2020 (table 8) or $730 billion per year (68 per cent for new capacity and 32 per cent for maintaining and replacing existing infrastructure) (Das and James, 2013).

Table 8. Infrastructure needs in the Asia-Pacific region, by sector, 2010-2020 ($ million)

Sector/subsector	New capacity	Replacement	Total
Energy (electricity)	3 176 437	912 202	4 088 639
Telecommunications	**325 353**	**730 304**	**1 055 657**
Mobile phones	*181 763*	*509 151*	*690 914*
Landlines	*143 590*	*221 153*	*364 743*
Transport	**1 761 666**	**704 457**	**2 466 123**
Airports	*6 533*	*4 728*	*11 261*
Ports	*50 275*	*25 416*	*75 691*
Railways	*2 692*	*35 947*	*38 639*
Roads	*1 702 166*	*638 366*	*2 340 532*
Water and sanitation	**155 493**	**225 797**	**381 290**
Sanitation	*107 925*	*119 573*	*227 498*
Water	*47 568*	*106 224*	*153 792*
Total	**5 418 949**	**2 572 760**	**7 991 709**

Source: ADB and ADBI (2009).

As traditional financing from taxes and borrowings will not be sufficient in addressing infrastructure gaps, the private sector should be tapped for infrastructure financing. Properly structured and managed PPPs could significantly contribute such financing based on the experiences of some Asia-Pacific economies. An enabling legal and regulatory environment, and appropriate and clear procurement rules and

[6] Based on a $1.25 per day poverty line.

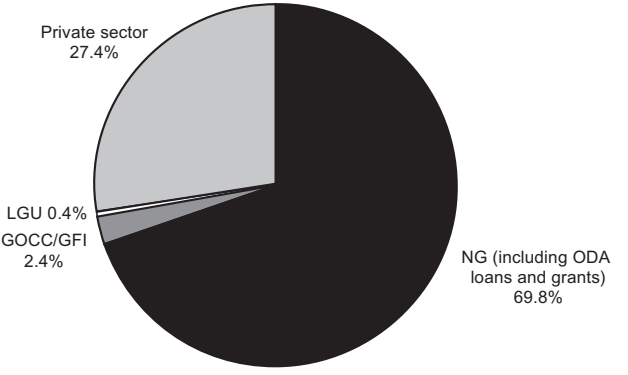
processes, at the minimum, are necessary to make PPPs a significant financing mechanism.

Procurement of infrastructure and public-private partnerships

Procurement methods for infrastructure differ across countries in the region. The procurement of goods and services in Armenia accounted for 4.5 per cent of GDP and 16.8 per cent of total budget in 2010 (ADB, 2011a). The Law on Procurement, adopted in 2010, changed procurement from a semi-centralized to a centralized system. Instead of using PPP, Armenia selects private constructors based on tenders for procurement of infrastructure services. However, Armenia has turned to PPPs as a means to finance infrastructure (TRACECA, n.d.).

In Pakistan, procurement follows the traditional and non-traditional procurement methods. Under the non-traditional method, the build-operate-own-transfer scheme was once used for a hydropower project. In general, the scheme is the most commonly used procurement method (Khalfan and others, 2013). In the Philippines, the Government is the single largest procuring entity (ADB, 2011c). Most of infrastructure investment targets for the period 2013-2016 are to be provided by the Government (70 per cent), but a sizeable share will be extended by the private sector[7] (figure 17).

Figure 17. Investment targets by funding source, 2013-2016



Source: Philippines, National Economic and Development Authority (2014).

Notes: ODA = official development assistance; LGU = local government unit; GOCC = government-owned and controlled corporation; GFI = government financial institutions; NG = national government.

[7] Public Investment Program 2011-2016.

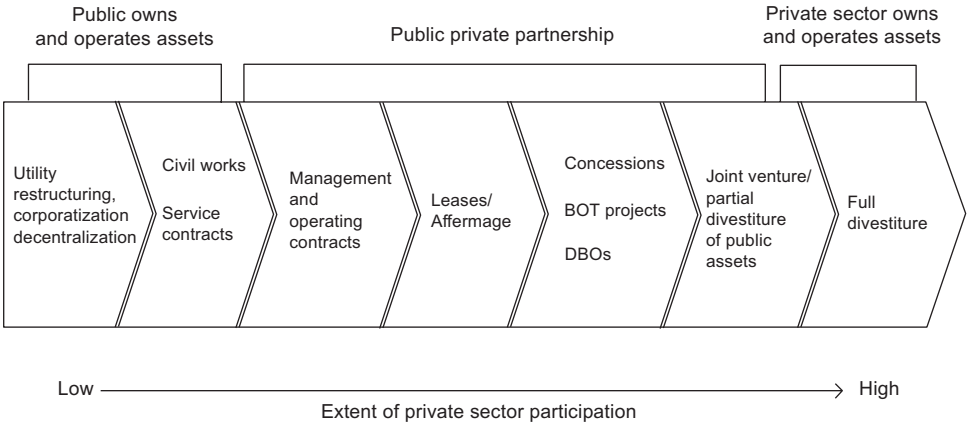
In China, government procurement rose from 3.1 billion Chinese yuan (RMB) ($470 million) in 1998 to 842.2 billion RMB in 2010 (ADB, 2011b), with physical infrastructure comprising the bulk of the procurement in 2010 (453.7 billion RMB); followed by goods (317.6 billion RMB), and services (70.9 billion RMB). Central government procurement excludes those made by State enterprises. For example, the Beijing-Shanghai High Speed Railway system was procured by State-owned enterprises. The Government Procurement Law allows the following procurement methods: (1) public tender; (2) private tender or tender by invitation; (3) competitive negotiation; (4) single-source procurement; (5) inquiry; and (6) other methods approved by the State Council regulatory authority for government procurement (Zhang, 2010). This law requires that public procurement comes from domestic sources except in certain instances. Infrastructure financing is sourced from fiscal resources, such as central, provincial, and local-level financing and off-budget fees, borrowing and market-based financing (Sahoo, Dash and Nataraj, 2010).

Public procurement in Viet Nam mostly covers expenditures for education, health care and infrastructure. The Tender Law, issued in 2013, allows the following procurement methods: (1) open competitive bidding, without restriction on the number of participants; (2) designated competitive bidding, which requires a direct invitation to at least five candidates; (3) appointed bidding, used in special circumstances; and (4) other methods subject to the prime minister's approval, if none of the aforementioned methods are viable (Hai and Watanabe, 2014).

Infrastructure financing remains largely dependent on traditional sources, such as tax revenues, external and domestic borrowings and ODA (ESCAP, 2013). Procurement of infrastructure has traditionally been the domain of the public sector, but some economies have tapped PPP to provide infrastructure. Infrastructure, such as toll roads, power plants and mass rail transport are amenable to PPP schemes. These schemes have freed public resources for other societal expenditures. PPP holds promise for developing economies that are unable to muster the resources, and managerial and technical expertise for the provision of infrastructure.

Public-private partnerships became popular in the United Kingdom of Great Britain and Northern Ireland and in the United States of America in the 1980s because of their potential for reducing public spending through the delegation of certain responsibilities to the private for-profit sector, and voluntary collaboration for the provision of public goods (Mitchell-Weaver and Manning, 1992). Since then, various PPP schemes have been adopted in different countries, depending on agreements on risk allocation, financing, operation and maintenance (figure 18). PPP schemes are now widely used in financing infrastructure, such as power, railways and roads (Felsinger, 2011).

Figure 18. Types of public-private partnership agreements



Source: PPPIRC (2015).

Notes: BOT = build-operate-transfer; DBO = design-build-operate.

Rationale for using public-private partnerships

ESCAP (2013) points out some reasons for using PPPs, namely: (a) access to private sector capital; (b) better risk allocation; and (c) efficiency gains. Increased access to private sector financing frees significant amounts to finance other important development projects. PPP schemes enable the involved parties to have better risk allocation depending on their relative comparative advantage and the project characteristics. The government is more efficient in handling regulatory risks while the private sector can better manage construction and operational risks. If structured carefully, PPPs lead to efficiency gains on the back of greater attention being focused on outputs rather than inputs to projects.

The World Bank Institute (2014) listed the following as advantages of PPPs as an infrastructure financing mechanism: (1) whole-of-life costing allows a single party to design, build, operate, and maintain the project, creating an incentive to complete the project at the least cost; (2) risk transfer and allocation; (3) focus on service delivery; (4) innovation; (5) asset utilization; (6) mobilization of additional funding, and; (7) accountability.

Public-private partnerships and sustainable infrastructure

Public-private partnerships may be useful in developing sustainable infrastructure. In a review of PPP cases, Colverson and Perera (2011) found that PPPs

provide timely and less costly infrastructure. For a large desalination project in Victoria, Australia, private proponents demonstrated how a PPP could efficiently integrate environmental considerations in large infrastructure projects. Project risks, such as those arising from meeting timeframes, obtaining necessary permits and getting community acceptance, are more efficiently allocated between the public and private sectors.

A successful PPP is the Nam Theun 2 Project, the largest hydropower project in the Lao People's Democratic Republic, which cost about $1.2 billion (approximately one third of the country's GDP). The Nam Theun 2 Power Company (NTPC), the operator of the project, is owned by the Électricité de France (35 per cent), the Government of the Lao People's Democratic Republic (25 per cent), the Electricity Generating Public Company of Thailand (25 per cent), and Italian-Thai Development Corporation (15 per cent). ADB provided $20 million in the form of a public sector loan, a $50-million private sector loan to NTPC, and a $50-million political risk guarantee to NTPC (ADB, 2012c). During the 25-year concession period, the Lao People's Democratic Republic expects to receive $2 billion of revenues from royalties, dividends, and taxes to be used for poverty reduction.

A case study on build-transfer-operate projects for ports (Kim, Kim and Choi, 2011) revealed the following: (1) from 1994 to 2008, transport volumes at ports increased by 4.9 per cent annually on average, with a steady rise in annual public investments; and (2) private investments to expand port facilities peaked in 2009 and then declined gradually until 2015. The study estimated savings of $580 million from the use of a public-private partnership instead of relying on turnkey-based government projects; and savings of $310 billion from using a public-private partnership instead of government bidding methods. A major issue was the difficulty of predicting cargo throughput, which is highly sensitive to market conditions. The study found the PPP scheme to be a viable and profitable alternative to public sector infrastructure provision.

Marins (2009), conducting an assessment based on information from more than 65 PPPs for urban water utilities serving a total population of about 100 million, found that private operators have the potential to improve project quality and efficiency in operations. One important concern is the incorporation of social goals in PPP water projects. The following recommendations were made: (1) make projects pro-poor; (2) account for the cost of social goals in the design of PPP projects; (3) subsidize access by the poor; (4) separate customer tariffs from the remuneration of the operator; (5) address the impact of PPPs on labour; and (6) maintain transparency in regulations. Some successful PPP projects on urban water utilities have been in implemented in Western and Central Africa, namely the Cote d'Ivoire Hybrid Affermage/Concession and Semegal Affermage (Fall and others, 2009).

Case studies of the Cartagena Water Supply, Sewage, and Environmental Management project in Colombia and the Vancouver Landfill Project in Canada showed that PPPs play an important role in providing sustainable infrastructure (Hamilton and Holcomb, 2013). The Cartagana Water Supply PPP provided significant management expertise that improved operational efficiency and effectiveness. Substantial social and economic benefits, such as greater water reliability, increased access to about 35,000 additional households, most of which were poor, significant reduction in water leaks, and employment of local social workers, community relations specialists and construction workers, which strengthened company-community relationship, were realized.

As for the Vancouver Landfill Project, private sector expertise and technology transformed waste into commercial energy; three hundred persons were employed, and the annual revenues of $300,000 covered most of the operating costs (Hamilton and Holcomb, 2013). The project (1) reduced gas emissions by 200,000 tons per year of carbon dioxide equivalents, which translates to the emissions volume of 40,000 automobiles, (2) captured about 500,000 gigjoules (GJ) of energy a year, the energy requirement for 3,000 to 4,000 households and (3) reduced the annual natural gas use of CanAgro[8] by about 20 per cent.

PEMSEA (2009) assessed the Sabang Sewerage Collection and Treatment System in Puerto Galera, Mindoro, the Philippines and found that PPP serves as an alternative delivery mechanism, especially when the government has limited technical, financial and management capability.

The importance of PPP is seen in efforts to include it in development strategies for the infrastructure sector. Indonesia established the PPP Center to handle project preparations and auctions.[9] Indonesia has two PPP projects as of October 2014: (a) Central Java Power Plant in Batang; and (b) Mine South Power Plant in South Sumatera (PPP center, 2014). Priority infrastructure investment needs is estimated to be about 5,452 trillion Indonesian rupiah (Rp) ($477 billion). PPPs represent an innovative way for government-private sector collaboration in providing high-quality public services and helping to close infrastructure funding gaps. The following are critical factors in achieving PPP success: (1) credibility of developers and equity financier supported by adequate local, technical, and financial resources; and (2) long-term funding and expertise (Indra, 2014).

[8] A private company that has the facilities to generate electricity and power through landfill gases.

[9] This initiative is a fulfilment of the commitment made by the Ministry of Finance during an APEC meeting held in Bali, Indonesia on 4 and 5 October 2013.

On 4 April 2013, the new PPP Act in Thailand, which replaced the Public Participation in State Undertaking Act B.E. 2535 (1992) enabled the approval process of projects through the PPP Policy Committee, headed by the Prime Minister of Thailand, to be streamlined. The State Enterprise Policy Office, the PPP secretariat, drafts a PPP strategic plan, assesses the feasibility of projects and provides a database on PPP schemes. The new PPP Act requires the host government agency to hire consultants to conduct feasibility studies of proposed infrastructure projects. A Private Investment Promotion Fund was created to give seed money for new investment projects. The Act provides the following (Larkin, 2014): (a) a comprehensive institutional and regulatory framework; (b) methodology for risk allocation and project evaluation; (c) value for money analysis; (d) contract management; and (e) a central agency to monitor investments. The government recognizes PPPs' role in infrastructure financing and efficient execution and management of projects. Rojanavanich (2014) estimated the total value of PPP projects in Thailand at about 1.7 trillion Thai baht ($57 billion) during the period 2014-2019.

Lessons from public-private partnership experiences

Experiences with PPPs in several countries have yielded valuable lessons for future implementation. PPP schemes are complex by nature, requiring a high level of managerial and technical expertise for project preparation, financing, and implementation. There are certain concerns associated with PPPs. Private borrowing costs for PPP projects are higher than government borrowing rates; this may lead to more costly projects in the long run while accountability and transparency issues arise because the private sector tends to be more stringent in releasing proprietary and confidential information on profits, costs, and other information (Colverson and Perera, 2011). Notwithstanding the success of PPPs in India, Verougstraete and Kang (2014) found that investment in detailed project preparation in India was significantly lower than in other countries. They attributed this to limited access to debt and equity financing, legal disputes, land acquisitions and related environment clearance issues.

In another review on PPPs, Ogunlana and Abednego (2009), using data from a perception survey of stakeholders of Yen Lenh Bridge BOT project in Viet Nam, reported serious issues of fairness, transparency, accountability, sustainability, effectiveness, and efficiency. On fairness, it found that government officials who had the authority over the concession company did overly optimistic feasibility studies to increase the chance of project approval. Biased information was used in project design and planning work. On transparency, the lack of transparent information resulted in varying and conflicting approaches to project risk mitigation. On accountability, an overly optimistic forecast of future growth and demand was made but actual revenue fell very short of projected revenue. On sustainability, lack of

coordination between government and the private sector put at risk the sustainability of the infrastructure development plan while corruption resulted in inefficient and poor quality construction, which created risks for the sustainability of the bridge. On effectiveness and efficiency, proper documentation of the project's risk profile for better risk management and administration was not done.

Box 1. Critical factors for successful public-private partnerships

- *An adequate legal and regulatory framework*: The UNCITRAL Legislative Guide on Privately Financed Infrastructure Projects provides basic guidelines for PPPs.
- *A consistent policy orientation:* Firm policies could help ensure continuity in contracts and project implementation despite changes in government administration.
- *Long-term relationship with the private sector.* Governments need to learn about long-term relationship management.
- *Need to build capacity*. Central and local governments, especially the latter where projects are located, need to develop capacity to manage PPPs.
- *Financial support measures.* Support measures, such as a viability gap fund, direct government payments, availability payments for projects that cannot charge user charges, state guarantees, and project development fund to support project preparation, are needed to encourage PPPs.

Source: ESCAP (2013).

Several economies in the region have limited capacity to formulate PPP structures. Box 1 summarizes critical factors for creating successful PPPs.

IV. NEW INSTITUTIONS FOR INFRASTRUCTURE FINANCING

The development finance landscape continues to change. New financial institutions have recently emerged[10] as alternative or complementary financing sources.

[10] There is a dearth of data on these institutions but it is important to mention them here because of their large potential in addressing the infrastructure gap in the Asia-Pacific region.

The Asian Infrastructure Investment Bank[11]

Twenty-one countries[12] launched the Asian Infrastructure Investment Bank on 24 October 2014 in Beijing to augment infrastructure financing. China provided initial capital of $40 billion, (80 per cent of the authorized capital of $50 billion). As the single biggest shareholder, China can control voting rights and bank decisions.

China declared that any country committed to regional and global development may join the Asian Infrastructure Investment Bank (AIIB). As of 20 March 2015, there are 34 prospective founding members.[13] Negotiations on the Articles of Agreement are ongoing with the target to sign and ratify it, and start operations within 2016.

Silk Road Infrastructure Fund[14]

China established the Silk Road Infrastructure Fund in November 2014 with capitalization of $40 billion (40 per cent of the authorized capital of $100 billion), using foreign exchange reserves and contributions from China Investment Corporation, the Export-Import Bank of China, and China Development Bank. It aims to finance infrastructure linking markets across Asian and Eurasian territories.

It began operations on 16 February 2015, focusing on roads, railways, ports, and other forms of infrastructure across Central Asia and South Asia (Jianxin and Wong, 2015). Plans include the development of a pilot economic zone in Taiwan Province of China, a new port city and highway in Sri Lanka and port facilities in Oman.

China views the Fund as an investment facility similar to a private equity fund and not a State-owned sovereign fund. Asian and non-Asian investors are welcome to invest in the Fund. An outstanding issue is the Fund's unclear allocation system (Bin, 2015).

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[11] Sources: Shaohui (2014); Current Affairs (2014); Asian (2015a; 2015b); Philippines, Department of Finance (2015).

[12] Bangladesh, Brunei Darussalam, Cambodia, China, India, Kazakhstan, Kuwait, the Lao People's Democratic Republic, Malaysia, Mongolia, Myanmar, Nepal, Oman, Pakistan, the Philippines, Qatar, Singapore, Sri Lanka, Thailand, Uzbekistan and Viet Nam.

[13] The additional members are: France; Germany; Hong Kong, China; Indonesia; Italy; Jordan; Luxembourg; Maldives; New Zealand; Saudi Arabia; Tajikistan; the United Kingdom; and Switzerland.

[14] China (2014; 2015), CMS HK (2015).

New Development Bank

Brazil, Russian Federation, India, China and South Africa (BRICS) established the New Development Bank (NDB) on 15 July 2014 during the Sixth BRICS Annual Summit (Preuss, 2014) to provide long-term financing for infrastructure and sustainable development projects (Griffith-Jones, 2014).

The bank is headquartered in China and its first president is India. NDB has initial capital of $50 billion, contributed equally by the BRICS members, of which $10 billion will serve as paid-in capital. A Contingent Reserve Arrangement, an emergency reserve fund of $100 billion will address short-term liquidity and global financial safety needs. With an annual lending limit of $34 billion, the bank is expected to start lending by the end-2015 (Watson, 2014).[15]

Some view the creation of NDB is the result of the frustration BRICS had with existing multilateral institutions; others see it as a new infrastructure finance bank (Khanna, 2014), with the following features (Griffith-Jones, 2014): (a) it is for financing infrastructure and sustainable development projects; (b) BRICS and developing countries accepted as members could provide additional contributions to paid-in capital; (c) loans are for BRICS and member developing countries, with priority to low-income countries which may receive subsidies; and (d) NDB will foster complementary financing with other banks.

ASEAN Infrastructure Fund

Incorporated in April 2012 in Malaysia to finance infrastructure and environmentally sustainable and socially inclusive projects, the ASEAN Infrastructure Fund (AIF) became operational in 2013 (ADB, n.d.). The ASEAN economies and ADB made initial equity contributions of $485.3 million. Malaysia provided the largest contribution of $150 million. The ASEAN economies and ADB have committed to led funds amounting to $4 billion and $9 million, respectively. (ADB, 2012a; Sim, 2013). AIF will issue bonds starting in 2017 (ADB, n.d.).

The first project involving AIF was in December 2013 for the 500 kV Power Transmission Crossing Project between Java and Bali, Indonesia. AIF contributed $25 million, ADB, $224 million, and the Government of Indonesia, $161 million (ASEAN, 2013). AIF targets six infrastructure projects annually to be selected based on economic and financial criteria and impacts on poverty reduction.

[15] Other sources are Jia (2015); Asian (2015a).

V. CONCLUDING REMARKS

The infrastructure needs of Asia and the Pacific are massive and growing because of population growth and rapid urbanization. Tax revenues and borrowing continue to be significant sources of infrastructure financing for most economies. Only about 19 to 29 per cent of ODA has been used to finance infrastructure. Although relatively small and declining, ODA could serve as a strategic financing instrument for regional public goods, such as climate change and, public health, that resource-constrained developing economies could not ordinarily finance.

As public sector resources and ODA cannot fully cover infrastructure needs, PPPs have the potential to play a significant role in financing infrastructure. PPPs are a novel and important instrument as regional experience attests. PPPs are a complex type of financing instrument that would require, among other things, the right policy and regulatory frameworks, institutional capacity, effective risk mitigation and credit enhancement. Efficient risk allocations require a good understanding of such risks and appropriate risk mitigation instruments. In a few large countries, a substantial amount of infrastructure is financed through PPPs. However, PPPs have yet to become a significant infrastructure financing instrument for smaller developing economies. Those countries need to learn how to use that instrument for addressing infrastructure gaps.

New international finance institutions have emerged as alternative or complementary sources of infrastructure financing. Those new institutions, which are being bankrolled by China, have the financial muscle to finance large infrastructure projects. They could be the main sources of infrastructure financing in the future, given the large stock of foreign reserves held by China and the country's determination to have a greater influence in the region. China has used ODA to access food and raw materials in Africa and Asia.

In the absence of information, it is hard to say whether the Chinese-financed institutions will be complementary infrastructure financing sources, or operate independently and serve as a substitute for existing multilateral institutions. Collaboration, complementation and cooperation in infrastructure financing are the rational pathway to solve infrastructure gaps in the region. The challenge is to learn how to effectively deal with China, the rising economic and political power in the Asia-Pacific region.

REFERENCES

Ali, I., and E. Pernia (2003). Infrastructure and poverty reduction: What is the connection? Economics and Research Department Policy Brief Series, No. 13. Manila: Asian Development Bank.

ASEAN Infrastructure Fund grants first US$25 million loan to Indonesia (2013). *ASEAN Briefing*, 10 December. Available from www.aseanbriefing.com/news/2013/12/10/asean-infrastructure-fund-grants-first-us25-million-loan-indonesia.html. Accessed 4 February 2015.

Asian Development Bank (ADB) (2011a). Armenia: case study on e-government procurement development. Available from http://adbprocurementforum.net/wp-content/uploads/Armenia-eGP-case-study-June2011.pdf. Accessed 11 April 2015.

_____(2011b). Development of electronic government procurement in China. Available from http://adbprocurementforum.net/wp-content/uploads/PRC-eGP-Case-Study-October-2011.pdf. Accessed 11 April 2015.

_____(2011c). Philippines: case study on the Philippine government electronic government procurement (PhilGEPS). Available from www.adb.org/sites/default/files/project-document/61348/43149-012-reg-tacr-01.pdf. Accessed 11 April 2015.

_____(2012a). Facts and data about ASEAN infrastructure. Available from www.adb.org/features/fast-facts-asean-infrastructure-fund. Accessed 15 February 2016.

_____(2012b). *Infrastructure for Supporting Inclusive Growth and Poverty Reduction in Asia*. Manila. Available from www.adb.org/sites/default/files/publication/29823/infrastructure-supporting-inclusive-growth.pdf. Accessed 13 April 2015.

_____(2012c). *Public-private Partnership Operational Plan 2012-2020: Realizing the Vision for Strategy 2020 – the Transformational Role of Public-private Partnerships in Asian Development Bank Operations*. Manila. Available from www.adb.org/sites/default/files/institutional-document/33671/ppp-operational-plan-2012-2020.pdf. Accessed 13 April 2015.

_____(n.d.). Overview of the ASEAN Infrastructure Fund. Available from www.adb.org/site/aif/overview. Accessed 4 February 2015.

Asian Infrastructure Development Bank to be operational by year-end (2015a). *The Economic Times*, 2 January. Available from http://articles.economictimes.indiatimes.com/2015-01-02/news/57611692_1_aiib-asian-infrastructure-investment-bank-brics-development-bank. Accessed 17 March 2015.

Asian Infrastructure Investment Bank's first loan (2015b). *China-US Focus*, 14 January. Accessed 17 March 2015.

Bin, Y. (2015). China-Russia relations: Russia's pride and China's power. *Comparative Connections*, January. Available from http://csis.org/files/publication/1403qchina_russia.pdf. Accessed 15 March 2015.

The BRICS bank: an acronym with capital (2014). *The Economist*, 19 July. Available from www.economist.com/news/finance-and-economics/21607851-setting-up-rivals-imf-and-world-bank-easier-running-them-acronym. Accessed 18 March 2015.

China Merchants Securities (CMS HK) (2015). Where will the funds come from for the Belt and Road strategy? Capital sources for the 'Belt and Road' strategy, 16 January. CMS (HK) Equity Research Macro Report. Available from www.iichina.com/arfy/uploads/soft/150119/32320_0914112781.pdf. Accessed 15 March 2015.

China launches $40 billion Silk Road Infrastructure Fund (2015). *The Economic Times*, 16 February. Available from http://articles.economictimes.indiatimes.com/2015-02-16/news/59196963_1_china-development-bank-asian-infrastructure-investment-bank-aiib. Accessed 15 March 2015.

China's Xi pledges $40 billion for Silk Road Infrastructure Fund (2014). *Bloomberg News*, 8 November. Available from www.bloomberg.com/news/2014-11-08/china-s-xi-pledges-40-billion-for-silk-road-infrastructure-fund.html. Accessed 15 March 2015.

Colverson, S., and O. Perera (2011). Sustainable development: is there a role for public-private partnerships? A summary of an IISD preliminary investigation. Policy Brief, October. Manitoba, Canada: International Institute for Sustainable Development. Available from www.iisd.org/pdf/2011/sust_markets_PB_PPP.pdf.

Current Affairs (2014). Asian Infrastructure Investment Bank, 28 November. Available from www.currentaffairsedu.com/asian-infrastucture-investment-bank/. Accessed 18 March 2015.

Das, S., and C. James (2013). Addressing infrastructure financing in Asia. Institute of Southeast Asian Studies perspective, No. 27. Singapore: ISEAS Publishing. Available from www.iseas.edu.sg/images/pdf/ISEAS_Perspective_2013_27.pdf. Accessed 15 February 2016.

Dissou, Yazid, and S. Didic (2013). Infrastructure and growth. In *Infrastructure and Economic Growth in Asia*, *Economic Studies in Inequality, Social Exclusion and Well-Being*, J. Cockburn and others, eds. New York: Springer.

Egert, B., T. Kozluk, and D. Sutherland (2009). Infrastructure and growth: empirical evidence. William Davidson Institute Working Paper, No. 957. Michigan: University of Michigan. Available from http://deepblue.lib.umich.edu/bitstream/handle/2027.42/64356/wp95?sequence=1. Accessed 11 April 2015.

Estache, A., and G. Garsous (2012). The impact of infrastructure on growth in developing countries. IFC Economics Notes, Note 1. Washington, D.C.: International Finance Corporation. Available from www.ifc.org/wps/wcm/connect/054be8804db753a6843aa4ab7d7326c0/INR+Note+1+-+The+Impact+of+Infrastructure+on+Growth.pdf?MOD=AJPERES. Accessed 11 April 2015.

Fall, M., and others (2009). Reforming urban water utilities in Western and Central Africa: experiences with public-private partnerships, vol. 1: impact and lessons learned. Water Sector Board Discussion Paper Series, Paper No. 13. Washington D.C.: World Bank.

Felsinger, K. (2011). *Public-Private Partnership Handbook*. Washington, D.C.: World Bank. Available from http://documents.worldbank.org/curated/en/2011/06/14326196/public-private-partnership-handbook. Accessed 14 February 2015.

Geest, W., and J. Nunez-Ferrer (2011). Appropriate financial instruments for public-private partnership to boost cross-border infrastructure development-EU experience. Working Paper Series, No. 281. Tokyo: ADBI. Available from www.adbi.org/files 2011.05.13.wp281.financial.instruments.ppp.infrastructural.dev.eu.pdf. Accessed 11 April 2015.

Griffith-Jones, S. (2014). A BRICS development bank: a dream coming true? Discussion Paper, No. 215. Geneva: United Nations Conference on Trade and Development. Available from http://unctad.org/en/PublicationsLibrary/osgdp20141_en.pdf. Accessed 11 April 2015.

Hai, N., and T. Watanabe (2014). The status quo and perspective for improvement of public works procurement performance in Vietnam. Kochi, Japan: Graduate School of Engineering, Kochi University of Technology. Available from http://pbsrg.com/app/wp-content/uploads/2015/01/The-status-quo-and-perspective-for-improvement-of-public-works-procurement-performance-in-Vietnam.pdf. Accessed 11 April 2015.

Hamilton, G., and V. Holcomb (2013). *Public-Private Partnerships for Sustainable Development*. Geneva: United Nations Economic Commission for Europe.

Indra, B. (2014). Growth strategies for Indonesia infrastructure development. Presentation by the Director of Public Private Partnership Development Unit during EKONID/BMWi Business Conference in Indonesia, Jakarta, 3 November. Available from www.foundry-planet.com/fileadmin/redakteur/pdf-dateien/25-11-14-Five%20year%20outlook%20 Construction%20industry%20in%20Indonesia.pdf. Accessed 21 March 2015.

International Energy Agency (2014). *World Energy Outlook 2014*. Paris. Available from www.worldenergyoutlook.org/resources/energydevelopment/energyaccessdatabase/. Accessed 1 March 2015.

Jia, C. (2015). Asian Infrastructure Investment Bank to start operations this year. *China Daily*, 5 March. Available from www.chinadaily.com.cn/business/2015-03/05/content_19723410.htm. Accessed 17 March 2015.

Jianxin, L., and S. Wong (2015). China's $40 billion Silk Road fund starts work along PE lines: central bank. *Reuters*, 16 February. Available from http://in.reuters.com/article/.2015/02/16/us-china-silkroad-idINKBN0LK03720150216. Accessed 14 March 2015.

Jones, S. (2004). Contribution of infrastructure to growth and poverty reduction in East Asia and the Pacific. Background paper. Oxford, UK: Oxford Policy Management. Available from www.opml.co.uk/sites/default/files/ADB_Final_Report_2_0.pdf. Accessed 11 April 2015.

Khalfan, M., and others (2013). Perception of procurement on successful infrastructure project outcomes in Pakistan. Paper presented during the CIB World Building Congress 2013: Construction and Society in Proceedings of the 19th Triennial CIB World Building Congress. Brisbane, Australia, 5-9 May. Available from www.conference.net.au/cibwbc13/papers/cibwbc2013_submission_424.pdf. Accessed 11 April 2015.

Khanna, P. (2014). New BRICS bank a building block of alternative world order. Available from www.huffingtonpost.com/parag-khanna/new-brics-bank_b_5600027.html. Accessed 4 February 2015.

Kim, J., J.H. Kim, and S. Choi (2011). Public-private partnership infrastructure projects: case studies from the Republic of Korea, volume 2: cases of build-transfer-operate projects for port and build-transfer-lease projects for educational facilities. Mandaluyong City: ADB. Available from www.adb.org/sites/default/files/publication/29032/ppp-kor-v2.pdf. Accessed 2 February 2015.

Larkin, S. (2014). Partnering with the Thai government – the new PPP Act. *Advance,* March. Available from https://issuu.com/austcham/docs/advance_march_2014_final/1?e=2062779/7094434. Accessed 15 February 2016.

Llanto, G. (2013). Prouductivity growth in Philippine agriculture: the impact of infrastructure on agricultural productivity. Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA), Department of Agriculture-Bureau of Agricultural Research (DA-BAR), and Philippine Rice Research Institute (PhilRice).

Marin, P. (2009). Public-private partnerships for urban water utilities – a review of experiences for urban water utilities. Trends and Policy Options, No. 8. Washington, D.C.: World Bank.

Mitchell-Weaver, C., and B. Manning (1992). Public-private partnerships in third world development: a conceptual overview. *Studies in Comparative International Development*, vol. 26, No. 4, pp. 45-67.

Organisation for Economic Co-operation and Development (OECD) (2005-2013). *Creditor Reporting System: Aid Activities*. OECD International Development Statistics database. Available from DOI: http://dx.doi.org/10.1787/data-00061-en. Accessed 1 February 2015.

Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) (2009). Public-private partnership in sustainable development: the case of Puerto Galera. Case Study, vol. 1, No. 3 (November). Available from www.pemsea.org/sites/default/files/casestudy-v1n3-puertogalera.pdf. Accessed 5 March 2015.

Philippines, Department of Finance (2014). Philippines signs MOU on establishing Asian Infrastructure Investment Bank in China. Available from www.dfa.gov.ph/index.php/2013-06-27-21-50-36/phl-embassies-and-consulates/4717-philippines-signs-mou-on-establishing-asian-infrastructure-investment-bank-in-china. Accessed 17 March 2015.

Philippines, National Economic and Development Authority (2014). *Philippine Development Plan 2011-2016: Revalidated Public Investment Program*. Pasig City. Available from www.neda.gov.ph/wp-content/uploads/2014/09/updated_rev_pip-final_proof.pdf. Accessed 23 February 2016.

PPP center effective from January 2015 (2014). *Investor Daily*, 27 October. Available from www.indii.co.id/index.php/en/news-publication/weekly-infrastructure-news/ppp-center-effective-from-january-2015. Accessed 25 February 2016.

Preuss, H. (2014). BRICS score in Brazil, create New Development Bank. *The BRICS Post*, 15 July. Available from http://thebricspost.com/brics-score-in-brazil-create-new-development-bank/#.VsKMaLR97IV. Accessed 15 February 2016.

Public-Private Partnerships in Infrastructure Resource Center (PPPIRC) (2015). PPP arrangements: types of private-public partnership arrangements. Available from http://ppp.worldbank.org/public-privatepartnership/agreements. Accessed 25 August 2015.

Rojanavanich, S. (2014). Thailand's infrastructure investment plans. Paper presented during Thailand Focus 2014: Competencies & Growth Potential Conference. 27 August.

Sahoo, P., R. Dash, and G. Nataraj (2010). Infrastructure development and economic growth in China. Discussion Paper, No. 261. Chiba, Japan: Institute of Developing Economies.

Shaohui, T. (2014). Indonesia becomes 22nd founding member of AIIB. *Xinhua News Agency*, 27 November. Available from http://news.xinhuanet.com/english/world/2014-11/27/c_133818862.htm. Accessed 18 March 2015.

Sim, E. (2013). The ASEAN Infrastructure Fund's first loan. *The Establishment Post*, 24 December. Available from www.establishmentpost.com/asean-infrastructure-funds-first-loan/. Accessed 15 February 2016.

TRACECA (n.d.). Country report on infrastructure and finance Armenia. Baku, Azerbaijan: Transport Corridor Europe-Caucasus-Asia. Available from www.traceca-org.org/fileadmin/fm-dam/Investment_Forum/110506_ARM%20country%20report.pdf. Accessed 11 April 2015.

United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) (2013). Financing transport infrastructure. In *Review of Development in Transport in Asia and the Pacific: Transport as a Key to Sustainable Development and Regional Integration*. Bangkok. Available from www.unescap.org/sites/default/files/TransportReview_2013_Overview.pdf. Accessed 10 April 2015.

Verougstraete, M., and H. Kang (2014). Mobilizing private funding: the case of the national highways of India. United Nations Economic and Social Commission for Asia and the Pacific Public-Private Partnerships Case Study. Bangkok: ESCAP.

Watson, K. (2014). Brics nations to create US$100bn development bank. *BBC News*, 15 July. Available from www.bbc.com/news/business-28317555. Accessed 4 February 2014.

World Bank (2005-2013). Private Participation in Infrastructure Database. Available from http://ppi.worldbank.org/customquery. Accessed 3 February 2015.

World Bank Institute (2014). Public-private partnerships: reference guide version 2.0. Washington, D.C. Available from http://documents.worldbank.org/curated/en/2014/01/20182310/public-private-partnerships-reference-guide-version-20. Accessed 3 April 2015.

World Economic Forum (2014). *The Global Competitiveness Report 2014-2015*. Geneva. Available from www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2014-15.pdf. Accessed 29 March 2015.

Zhang, L. (2010). Government procurement law and policy: China. The Law Library of Congress. Available from www.loc.gov/law/help/govt-procurement-law/china.php. Accessed 11 April 2015.