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Working Paper

Philippine Priorities in Expanding APEC-Wide Connectivity through Infrastructure Development

PIDS Discussion Paper Series, No. 2015-15

Provided in Cooperation with:
Philippine Institute for Development Studies (PIDS), Philippines

Suggested Citation: Navarro, Adoracion M. (2015) : Philippine Priorities in Expanding APEC-Wide Connectivity through Infrastructure Development, PIDS Discussion Paper Series, No. 2015-15, Philippine Institute for Development Studies (PIDS), Makati City

This Version is available at:
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Philippine Institute for Development Studies
Surian sa mga Pag-aaral Pangkaunlaran ng Pilipinas

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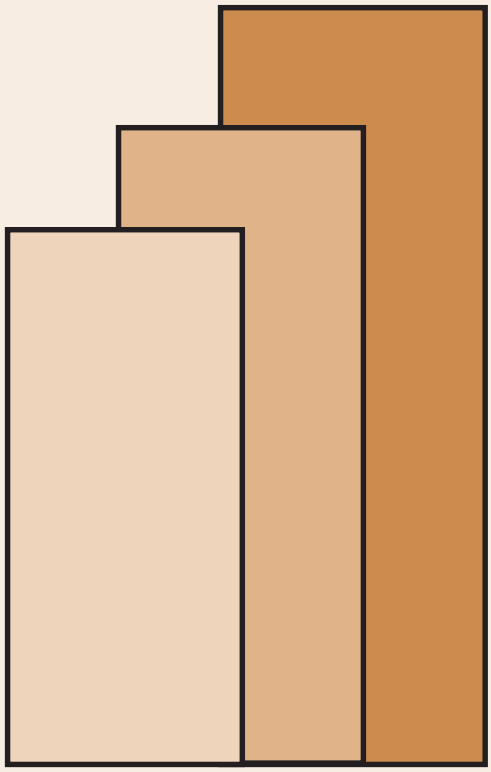

February 2015

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Philippine Priorities in Expanding APEC-Wide Connectivity through Infrastructure Development[1]

Dr. Adoracion M. Navarro

Philippine Institute for Development Studies

[1] This paper is an output of the APEC 2015 Research Project commissioned by the Department of Foreign Affairs. The main objective of the project is to provide the analytical framework that will form part of the basis for the substantive priorities the Philippines will push for as APEC host economy in 2015. The project's main output is a set of policy studies with recommendations that can serve APEC 2015 purposes and can be used as inputs to the Philippine government's future development planning, strategizing, and visioning exercise in a post-2015 scenario.

Philippine Priorities in Expanding APEC-Wide Connectivity through Infrastructure Development

Submitted by

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May 2014

Abstract

Well-developed infrastructure systems and services are vital means of enhancing the connectivity of Asia-Pacific Economic Cooperation (APEC) member economies. In essence, efforts by APEC to enhance connectivity through infrastructure should be considered regional public goods since these create positive spill-over effects for each member of the region, or net benefits for a member which are greater than what it could achieve if it were to produce the by-products of regional cooperation on its own. To contribute to APEC efforts and at the same time help meet the infrastructure development needs of the Philippines, this study recommends that the Philippine government elevate cross-cutting topics and sector-specific concerns as priorities for discussion during its hosting of APEC 2015. The Philippines can propose regional cooperation on investing and building disaster-resilient infrastructure, as well as sharing of best practices and lessons learned in complying with infrastructure resilience requirements (e.g., plans, technologies, and logistics for humanitarian activities). The Philippines can also drive discussions related to public-private partnerships (PPPs) by expressing the need for truly dynamic capacity building and sharing of best practices on viability studies, risk sharing, and contracting (from design to management and monitoring)—which are crucial factors in ensuring that PPP projects are bankable. The Philippines can also recommend knowledge sharing and actual investments toward infrastructure quality upgrading in the transport, energy, telecommunications and information sectors.

Key Words: APEC, connectivity, energy, infrastructure, public-private partnerships, regional cooperation, telecommunications and information, transportation

[2] The excellent research assistance of Keith C. Detros is gratefully acknowledged.

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EXECUTIVE SUMMARY

In anticipation of the Philippines' hosting of the 23rd APEC Economic Leaders' Meeting in 2015, the Department of Foreign Affairs engaged the Philippine Institute for Development Studies, together with various research partners, to come up with studies identifying key issues and concerns that can be included in the host economy's priorities. As one of those studies, this paper tackles the topic *Infrastructure Development* under the research theme *Expanding Connectivity*.

This study uses as analytical framework the classical foundation of infrastructure connectivity-inclusive economic growth linkage and the theory of public goods applied at a regional level. By facilitating the mobility of production inputs like labor, financial capital, machineries and equipment, physical infrastructure increases the opportunities for engaging in economic activities and speeds up the delivery of social services to remote areas. By virtue of the non-excludability and non-rivalry properties of regional cooperation in infrastructure development, any product of such cooperation is a regional public good since it creates positive spill-over effects for each member of the region, or net benefits for a member which are greater than what it could achieve if it were to produce the product on its own. Examples of APEC infrastructure connectivity initiatives that have regional public good elements are: improving cross-border infrastructure and trade, bridging technology divide and utilization, expanding investment flows, and sharing of best practices and harmonization of standards.

In this study's assessment of how the Philippines is faring in infrastructure development and physical connectivity within the Asia-Pacific region, it found that the Philippines ranks low among APEC members in terms of stock and quality of infrastructure. In rankings using infrastructure indices developed by international institutions (e.g. World Economic Forum, International Telecommunications Union, and United Nations Conference on Trade and Development), the Philippines is often grouped with the poor performers. It is therefore obvious that the Philippines needs to increase the stock and improve the quality of its infrastructure. APEC can play a role in helping the Philippines achieve this objective through greater regional financing and investments (including public-private partnerships or PPPs), more knowledge-sharing on institutional reforms, and increased regional cooperation on capacity building.

This study recommends that as host economy for APEC 2015, the Philippines elevate the following cross-cutting topics (i.e., cutting across infrastructure sectors) and sector-specific concerns as priorities for discussion:

Building disaster-resilient infrastructure. The devastation wrought by Typhoon Haiyan in 2013 put to greater light the socio-economic benefits of having disaster-resilient infrastructure. The Philippines can recommend regional cooperation on investing and building disaster-resilient infrastructure, as well as sharing of best practices on the effective use of infrastructure during calamities. Particularly in the areas of transportation, telecommunications and information, the Philippines can push for technical assistance from developed member economies to disaster-prone member economies. From its experiences in dealing with strong typhoons, earthquakes and other calamities, the Philippines can share the lessons learned in terms of resilience requirements of infrastructure (e.g., plans, technologies, and logistics for humanitarian activities). It can also advocate for the adoption of best practices, such as the best use of modern telecommunications and information infrastructure, in responding to disasters more efficiently and effectively. In the energy sector, regional cooperation can be sought for both physical infrastructure and energy supply. The APEC Energy Security Initiative can be a platform for the Philippines to lead the discussion on energy concerns. In addition, the Philippines can push for more knowledge building on how regional energy market integration can be an instrument for dealing with emergency situations in the Asia-Pacific region.

Financing infrastructure development through traditional public investment models and PPPs. Infrastructure development in the Philippine Public Investment Program 2011-2016 will mostly be financed by the national government. To ensure sustainability of infrastructure investments going forward, other sources of funding, such as regional sources and private sector funds, should also be considered. It is therefore recommended that the Philippines include in its priorities the need to augment local resources for infrastructure development with regional sources such as official development assistance (ODA) and regional equity funds. Moreover, it is recommended that information sharing on best practices on the use of such sources be pursued. The APEC discussions on financing can also become a venue to request

China to provide more information on its planned Asian Infrastructure Investment Bank (AIIB). Despite the more than one year of news circulation about the AIIB, important details have not yet surfaced, such as currency risk bearing by borrower countries and improvements in Chinese models on governance standards and environmental assessments.

It is also recommended that the Philippines prioritize PPP-related topics in APEC discussions. The Philippines can ask for regional cooperation on sustained, dynamic and productive capacity building assistance on PPPs to less advanced APEC members so that these members can generate a pipeline of bankable infrastructure PPPs. The Philippines can drive the PPP-related discussions by expressing the need for more sharing of knowledge and best practices on viability studies, risk sharing, and contracting (from design to management and monitoring)— which are crucial factors in ensuring that PPP projects are bankable.

Other recommendations. On transport, the study recommends regional cooperation in knowledge-sharing and actual investments on upgrading maritime safety standards, expanding air transport capacity, and improving the quality of air transport services. On telecommunications and information, the study recommends regional cooperation in facilitating investments to increase the capacity of Philippine broadband infrastructure. It also notes that the Philippine telecommunications industry is private sector-led and Republic Act 8182 prohibits the use of ODA for telecommunication projects. Therefore, the study recommends the exploration of regional equity funds and commercial credit as sources of financing. It also recommends the sharing of best practices on the optimum utilization of broadband technologies in view of the upcoming additional capacity once a major East Asian submarine fiber optic cable is completed. On energy, the study recommends that the Philippines support the continuing efforts to attain an energy-efficient APEC because of the positive implications of these to energy supply stability. The study also recommends that the Philippines take the lead in discussing the difficult challenge of responding to public calls for maintaining electricity price affordability in a restructured and liberalized environment. The Philippines can recommend knowledge sharing on how advanced member economies, which already have a long experience in electric power industry liberalization, ensure the affordability

and reasonableness of electricity tariffs and design policies and rules that minimize price spikes in electricity markets.

These recommendations were arrived at by profiling the APEC organizational structures for infrastructure, assessing their recent initiatives, and then identifying the complementation between domestic concerns and such initiatives. This is in view of the Department of Foreign Affairs' suggestion that its research partners build on recent initiatives of APEC.

I. Introduction

The Department of Foreign Affairs (DFA) engaged the Philippine Institute for Development Studies (PIDS) and other institutional research partners to undertake the "Research Project on APEC 2015 Host Economy Priorities." Among the Project's research themes is *Expanding Connectivity* and under this theme, *Infrastructure Development* is one of the topics. This study tackles this topic.

This study aims to: (i) assess how the Philippines is faring in infrastructure development and physical connectivity within the Asia-Pacific Economic Cooperation (APEC) region; and (ii) recommend strategies and activities that the Philippines can elevate to APEC discussions on infrastructure. In previous meetings and workshops for the project, the DFA asked its research partners to build on recent initiatives of APEC. This study does this by profiling the APEC organizational structures for infrastructure, assessing their recent initiatives, and then identifying the complementation between domestic concerns and such initiatives. The results of this study will form part of the inputs to the host economy priorities that will be presented during the Philippines' hosting of the 23rd APEC Economic Leaders' Meeting in 2015.

At present, APEC has working groups for three sectors: transportation, telecommunications and information, and energy. For the water sector, there is no working group under the APEC organizational structure but water security issues are being discussed inside the APEC Business Advisory Council (ABAC), which is a structure outside APEC and which provides inputs from the business sector. Given that recommendations are likely to be sustained if these will be linked to APEC initiatives that are already in place, this study limits its focus on the three sectors for which there are organizational structures **within** APEC. Water sector-related issues may be tackled in the discussions of ABAC, with which the DFA is closely working.

This paper is organized into five sections, beginning with this introduction. Section II describes the analytical framework. Section III assesses the state of infrastructure development in the Philippines relative to its peers within the Asia-Pacific region and evaluates its physical

connectivity to other APEC member economies and the rest of the world. Section IV explains the recent initiatives of APEC in dealing with infrastructure concerns. The last section, Section V, provides recommendations on possible host economy priorities for infrastructure, including fresh ideas on topics for discussion wherein the Philippines can take the lead.

II. Analytical Framework

What the classic literature says on infrastructure provides a good foundation for appreciating the importance of physical connectivity in ensuring that all APEC members are able to share in the positive spill-over effects of regional cooperation. The theory of public goods applied at a regional level cements that foundation.

With as much certainty as we have today, Adam Smith asserted in 1776 the importance of connectivity-enhancing physical infrastructure in promoting inclusive growth. In his *An Inquiry into the Nature and Causes of the Wealth of Nations*, he said:

> "*Good roads, canals, and navigable rivers, by diminishing the expense of carriage, put the remote parts of the country more nearly upon a level with those in the neighbourhood of the town. They are upon that account the greatest of all improvements. They encourage the cultivation of the remote, which must always be the most extensive circle of the country... Though they introduce some rival commodities into the old market, they open many new markets to its produce*."

Physical infrastructure enables connectivity and increases opportunities for engaging in economic activities such as trade and tourism. It stimulates the mobility of production inputs like labor, financial capital, machineries, and equipment. It also speeds up the delivery of social services to remote areas. This is true not only at the country level but also at the regional level.

Regional cooperation in infrastructure development, such as the one facilitated by the APEC forum, can also be viewed as a public good since it creates positive spill-over effects for each member of the region, or net benefits for a member which are greater than what it could achieve if

it were to produce the by-products of regional cooperation on its own. Sandler (2007) defines regional public goods as providing benefits to individuals in two or more nations in a well-defined region, which may be defined on a geological, political, geographical, cultural or meteorological basis. In the APEC region, it can be considered that the ties are political and geographical.

We can analyze regional public goods by looking at their non-excludability and non-rivalry properties (the two properties well-explained by classical public goods theory), as is done in the examples that follow. Examples of regional public goods in infrastructure development include regional harmonization of standards in infrastructure network operation and setting up of regional financing facilities for technical assistance or actual investments. Harmonized regional standards are pure public goods since the enjoyment of benefits is completely non-rival and non-excludable, that is, a country's use of the regional standards does not reduce the other countries' benefits from these. Moreover, the wide availability of information on these standards precludes exclusion of and by any country. A regional financing facility, in contrast, is an impure public good since the enjoyment of benefits is partially rival and may be partially exclusive. Successful access to the financing facility by one country reduces the amount of financing, at least relative to the seed money, which can be made available to other member countries. The facility may be partially exclusive if there are certain criteria to be met before a member country can apply for financing.

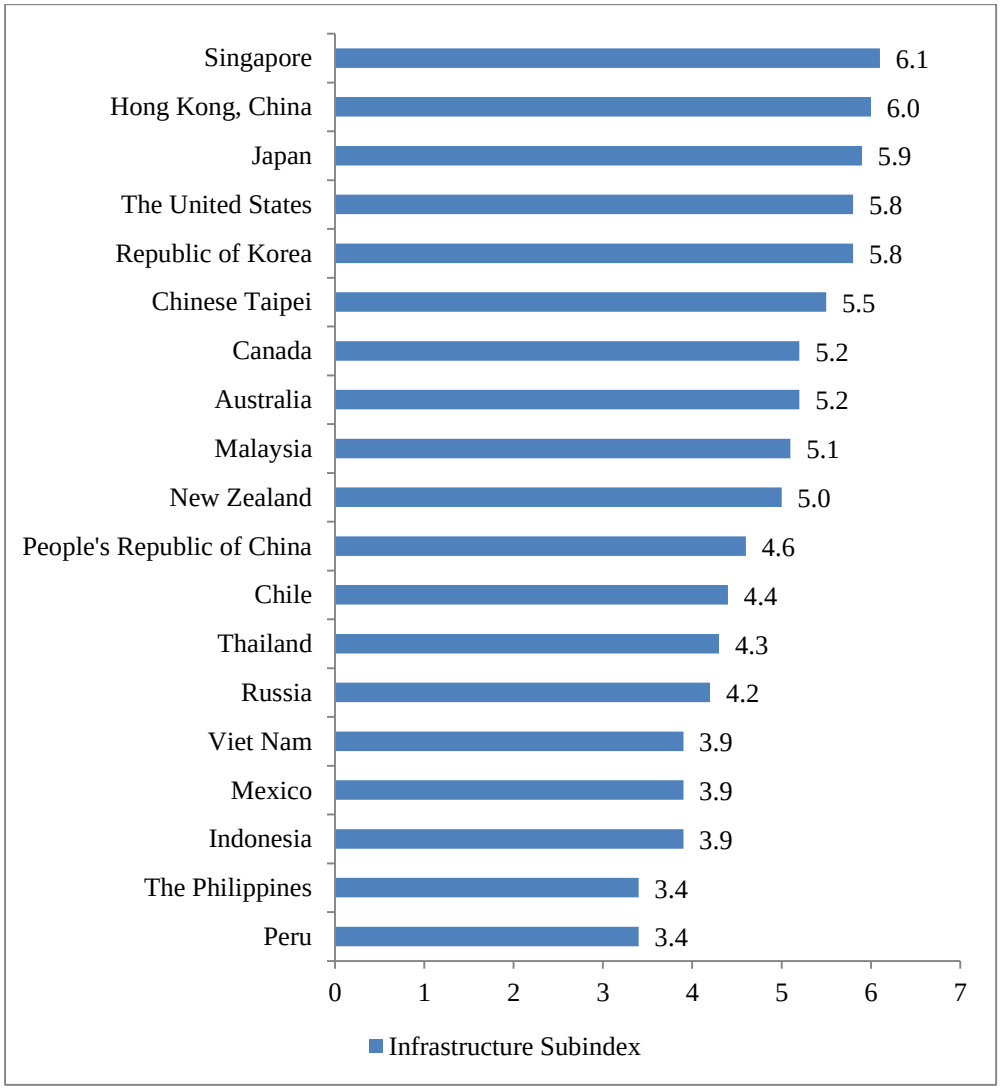
Within APEC, infrastructure connectivity cooperation as a regional public good is being delivered through efforts in:

- improving cross-border infrastructure
- enhancing technology utilization and bridging the technology divide
- expanding investment flows through innovative financing schemes such as public-private partnerships
- sharing of best practices and harmonization of standards

III. State of Infrastructure Development and Physical Connectivity within APEC

The Philippines is lagging behind most of its APEC neighbors in infrastructure stock and quality rankings. According to the *Global Enabling Trade Report* 2014, the Philippines and Peru have the poorest trade-enabling infrastructure among APEC economies (Figure 1).

Figure 1. Infrastructure Scores in Enabling Trade Index, 2014



Note: Maximum possible score is 7. No available scores for Brunei Darussalam and Papua New Guinea.

Source: World Economic Forum, *The Global Enabling Trade Report* 2014.

The Philippines is also ranked very low in terms of quality of overall infrastructure. In the *Global Competitiveness Report* 2013–2014, the Philippines got a score of 3.7 (maximum possible score is 7) for overall quality of infrastructure, which puts the country in 98th place among 148 countries that were ranked. Among APEC economies, the Philippines ranks third from the bottom (Table 1).

Table 1. Quality of Overall Infrastructure within APEC, 2014

ASEAN Member State	Quality of Overall Infrastructure
Hong Kong, China	6.5
Singapore	6.4
Japan	6.0
Canada	5.8
The United States	5.7
Republic of Korea	5.6
Chinese Taipei	5.5
Malaysia	5.5
Australia	5.2
Brunei Darrusalam	5.1
New Zealand	5.1
Chile	5.0
Thailand	4.5
Mexico	4.4
People's Republic of China	4.3
Indonesia	4.0
Russia	3.8
The Philippines	3.7
Peru	3.6
Viet Nam	3.4

Note: Values are on a 1-to-7 scale. A total of 148 economies were surveyed. Papua New Guinea was not included in the survey.
Source: World Economic Forum, *The Global Competitiveness Report* 2013–2014.

The sad state of Philippine infrastructure has been largely due to underinvestment in capacity expansion or upgrading and coordination failures within the institutional and regulatory

environment. A mapping of fiscal resources from 2008-2012[3] in Navarro and Llanto (2014) shows that the country's infrastructure investment record in the past has been poor. Public infrastructure as a share of gross domestic product (GDP) ranged between a low of 1.4 percent to a high of 2.09 percent over the period. This is a far cry from the current target of 5 percent of GDP over the medium term. The Philippine Development Plan 2011-2016 also explains that inadequate project preparation, poor project quality-at-entry, and poor project execution are causing implementation delays. The institutional and regulatory environment is also beset by the following challenges: (i) the need to separate the operation and regulatory functions, especially in the ports sector; (ii) the need to establish independent regulators and create regulatory frameworks in sectors where they are lacking; and (iii) the need to strengthen regulatory institutions.

Looking closely at the sectors within infrastructure also reveal the same pattern of poor ranking in infrastructure availability and quality. The discussion that follows describes how the Philippines is ranked among APEC economies in the transportation, telecommunications and information, and energy sectors.

Transportation

The *Global Competitiveness Report*'s rankings show that within APEC, the Philippines is among the countries with poor quality of airports, roads, railroads, and port infrastructure. It is at the bottom of the ranking in terms of quality of air transport infrastructure, fourth from the bottom in terms of quality of roads, second from the bottom in terms of quality of railroad infrastructure, and at the bottom in terms of quality of port infrastructure (Table 2).

[3] This time period was dictated by the coverage of the Navarro and Llanto (2014) study.

Table 2. Quality of Transport Infrastructure within APEC, 2014

ASEAN Member State	Quality of Air Transport Infrastructure	Quality of Roads	Quality of Railroad Infrastructure	Quality of Port Infrastructure
Singapore	6.8	6.2	5.6	6.8
Hong Kong, China	6.7	6.2	6.5	6.6
New Zealand	6.0	5.0	3.7	5.5
Canada	5.9	5.6	5.0	5.5
The United States	5.9	5.7	4.9	5.7
Republic of Korea	5.8	5.8	5.7	5.5
Malaysia	5.8	5.4	4.8	5.4
Australia	5.6	4.9	4.1	5.0
Thailand	5.5	4.9	2.6	4.5
Chinese Taipei	5.4	5.9	5.7	5.3
Japan	5.2	6.0	6.7	5.2
Chile	5.2	5.4	2.7	5.2
Brunei Darrusalam	4.8	5.0	n/a	4.7
Mexico	4.7	4.6	2.8	4.4
People's Republic of China	4.5	4.5	4.7	4.5
Indonesia	4.5	3.7	3.5	3.9
Peru	4.2	3.3	1.8	3.7
Viet Nam	4.0	3.1	3.0	3.7
Russia	3.9	2.5	4.2	3.9
The Philippines	3.5	3.6	2.1	3.4

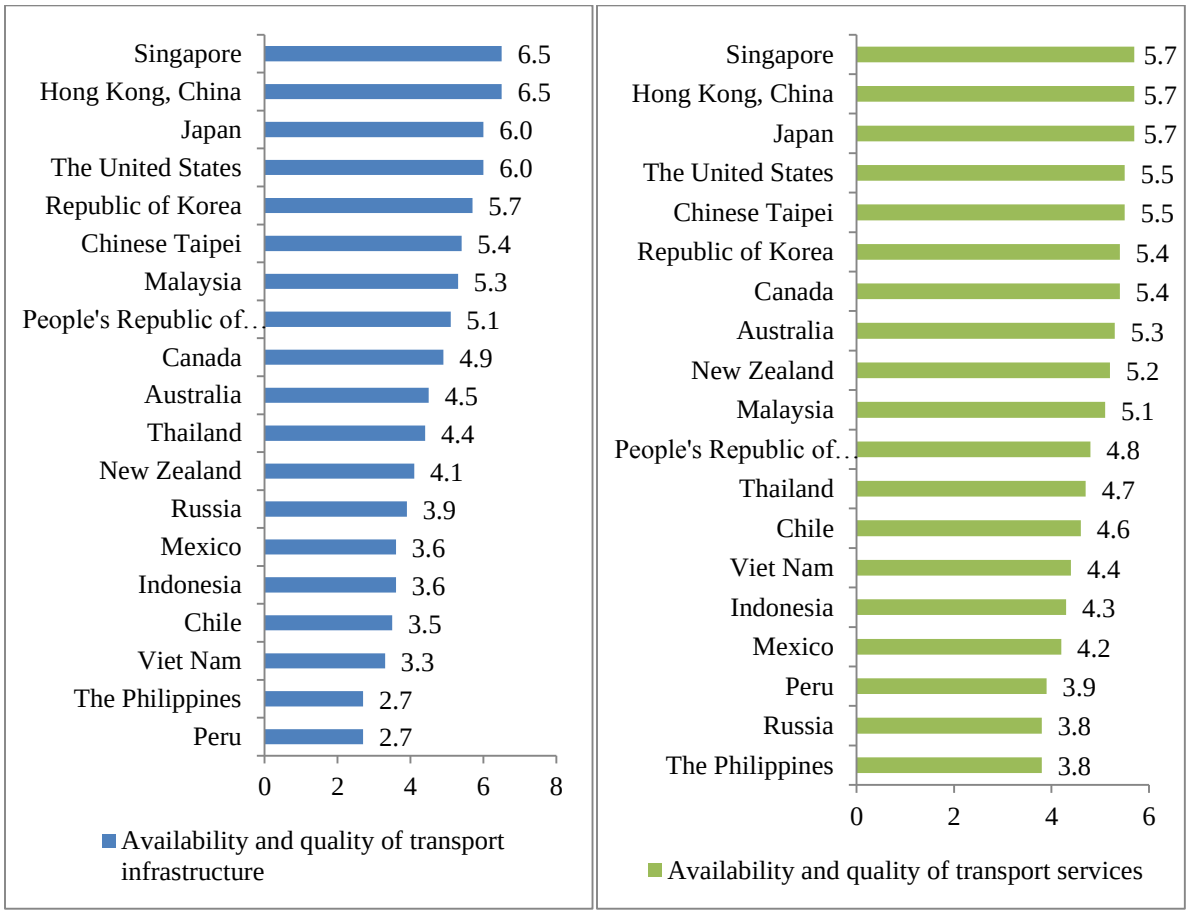
Note: Values are on a 1-to-7 scale. A total of 148 economies were surveyed. Papua New Guinea was not included in the survey.

Source: World Economic Forum, *The Global Competitiveness Report* 2013–2014.

The *Global Enabling Trade Report* 2014, which includes transport services, reveals almost the same pattern. Among APEC economies, the Philippines scored the lowest in terms of availability and quality of transport infrastructure and transport services (Figure 2). The rankings are based on the enabling transport subindexes in the overall enabling trade index measure. The enabling

transport subindex indicates the extent to which a country has in place the transport infrastructure necessary to facilitate the movement of goods within the country and across its borders.

Figure 2. Availability and quality of transport infrastructure and services, 2014



Note: Maximum possible score is 7. No available scores for Brunei Darussalam and Papua New Guinea.
Source: World Economic Forum, *The Global Enabling Trade Report* 2014.

In terms of connectivity via maritime transportation, the Philippines is also among the lowest-ranked APEC economies in the 2013 liner shipping connectivity index of the United Nations Conference on Trade and Development (UNCTAD). It was ranked 16th among the 20 APEC economies assessed by UNCTAD (Table 3). The liner shipping connectivity index measures how

well a country is connected to global shipping networks. The UNCTAD computes the index based on the country's number of ships, container-carrying capacity of ships, maximum vessel size, number of services, and number of companies that deploy container ships.

Table 3. Liner Shipping Connectivity Index (LSCI), 2013

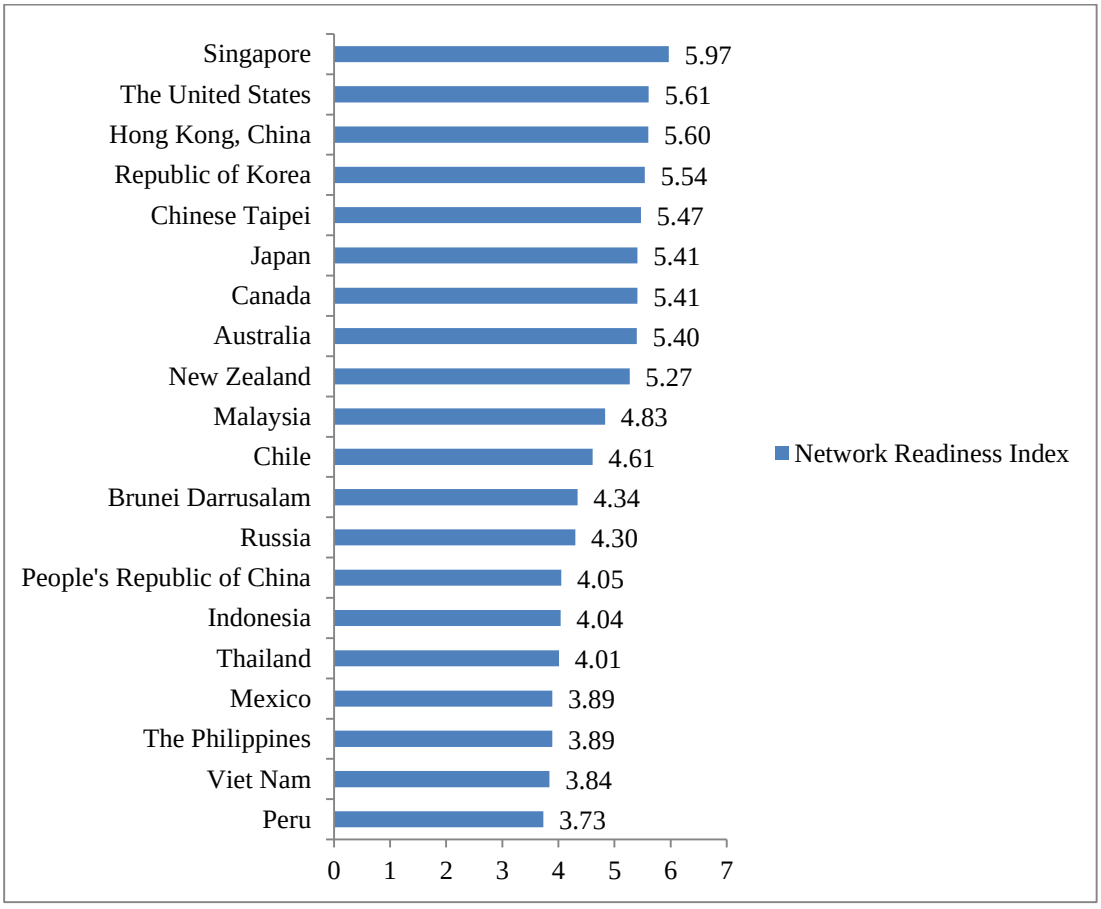
APEC Member	LSCI in 2013	Rank within APEC
Singapore	106.91	1
Malaysia	98.18	2
United States	92.80	3
Japan	65.68	4
Chinese Taipei	64.23	5
Viet Nam	43.26	6
Mexico	41.80	7
Canada	38.44	8
Thailand	38.32	9
Chile	32.98	10
Peru	32.84	11
Australia	29.87	12
Indonesia	27.41	13
Russia	25.73	14
New Zealand	18.95	15
Philippines	18.11	16
Hong Kong, China	10.73	17
Papua New Guinea	6.61	18
Brunei Darussalam	4.61	19
Republic of Korea	3.35	20
People's Republic of China	n.a.	n.a.

Source: United Nations Conference on Trade and Development (UNCTAD), Liner Shipping Connectivity Index, 2004-2013.

Telecommunications and Information

The indicators for the telecommunications and information sector[4] are also not reassuring. In terms of Networked Readiness Index computed in *The Global Information Technology Report* 2014, the Philippines and Mexico are third from the bottom among APEC economies (Figure 3). The Networked Readiness Index measures: (i) the environment for information and communication technology (ICT); (ii) the readiness of a society to use ICT; (iii) the actual usage of all main stakeholders; and (iv) the impacts that ICT generates in the economy and society.

Figure 3. Networked Readiness Index, 2014



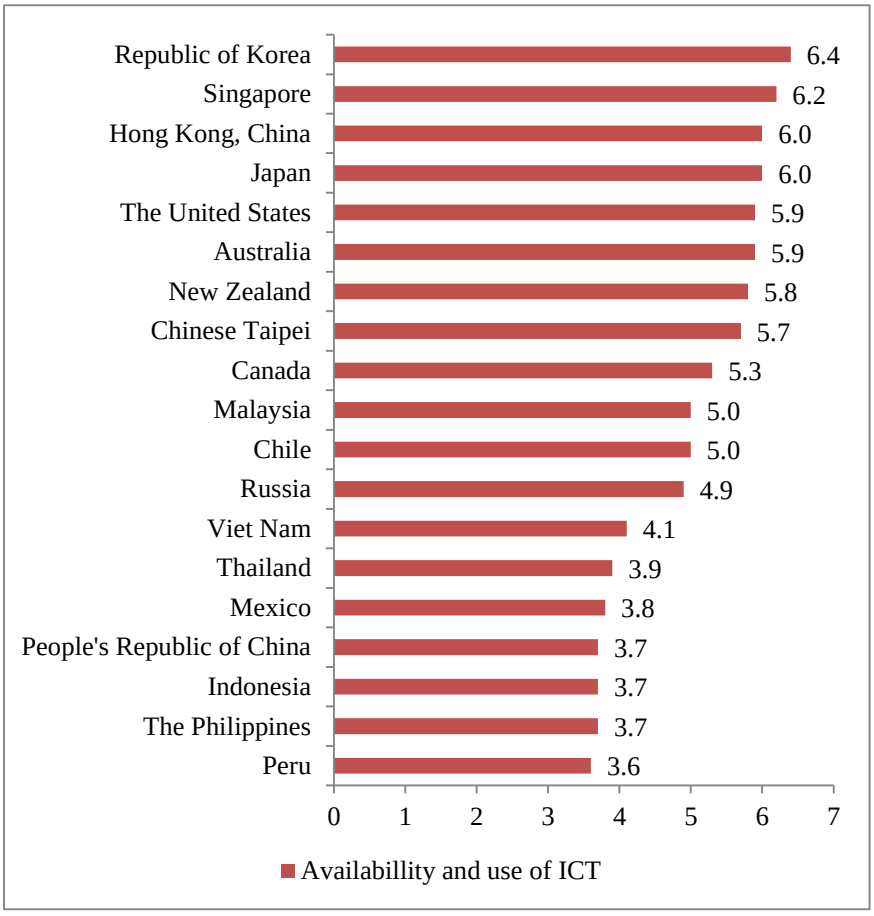
Note: Scores are on a scale of 1 (worst possible outcome) to 7 (best possible outcome).

Source: World Economic Forum and INSEAD, *The Global Information Technology Report* 2014.

[4] This study uses the phrase "telecommunications and information" to refer to the sector, rather than information and communications technology (ICT), in order to be consistent with the terminology of APEC.

In *The Global Enabling Trade Report* 2014, the Philippines is second to the bottom in the ranking of availability and use of ICT. This subindex measures the extent to which a country has in place the ICT infrastructure necessary to facilitate the movement of goods within the country and across its borders.

Figure 4. Availability and use of ICT, 2014



Note: Maximum possible score is 7. No available scores for Brunei Darussalam and Papua New Guinea.

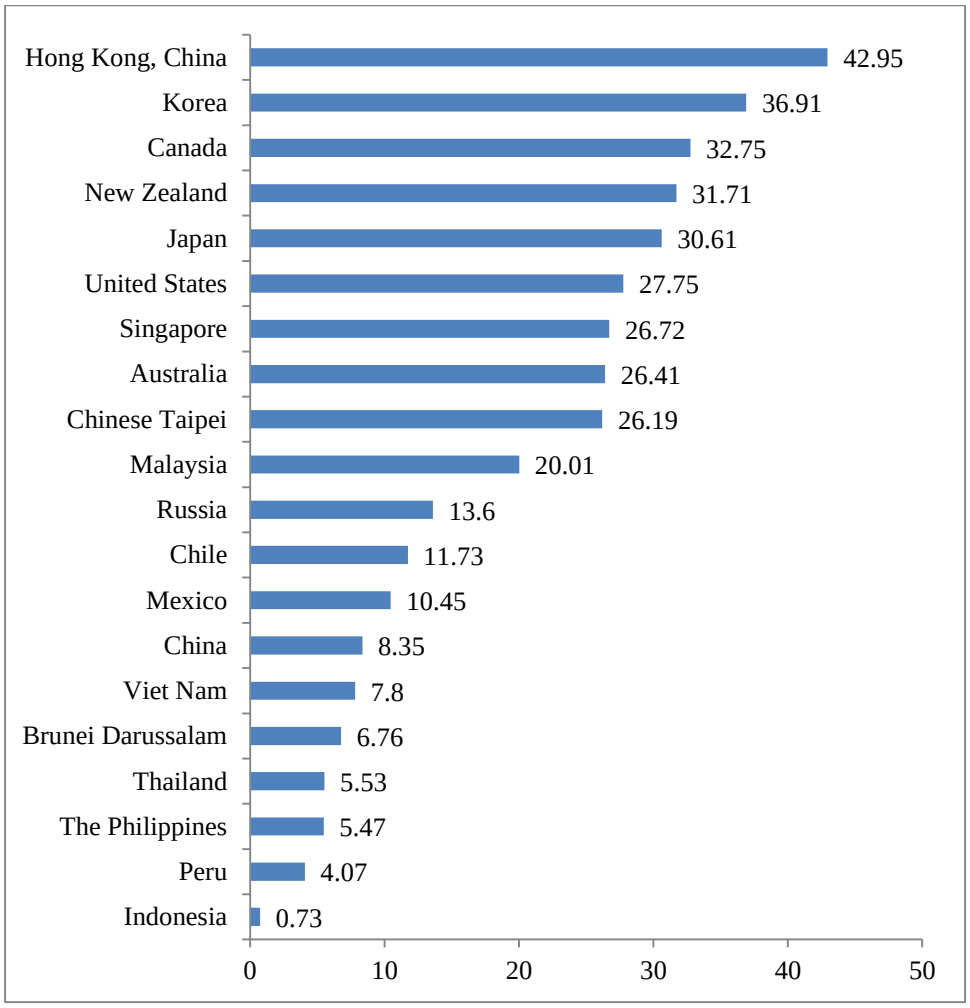
Source: World Economic Forum, *The Global Enabling Trade Report* 2014.

The 2011 (latest available) compilation of telecommunications indicators by the International Telecommunication Union (ITU) shows that the Philippines is third from the bottom in terms of actual Internet subscription density (Figure 5). The ITU defines Internet subscriptions as those

subscriptions with fixed (wired) Internet access, which includes all dial-up and total fixed broadband subscriptions. In counting the number of subscriptions, only active subscriptions that have used the telecommunication system within the past three months are included.

Figure 5. Internet subscriptions per 100 inhabitants

(in 2011, unless stated otherwise)

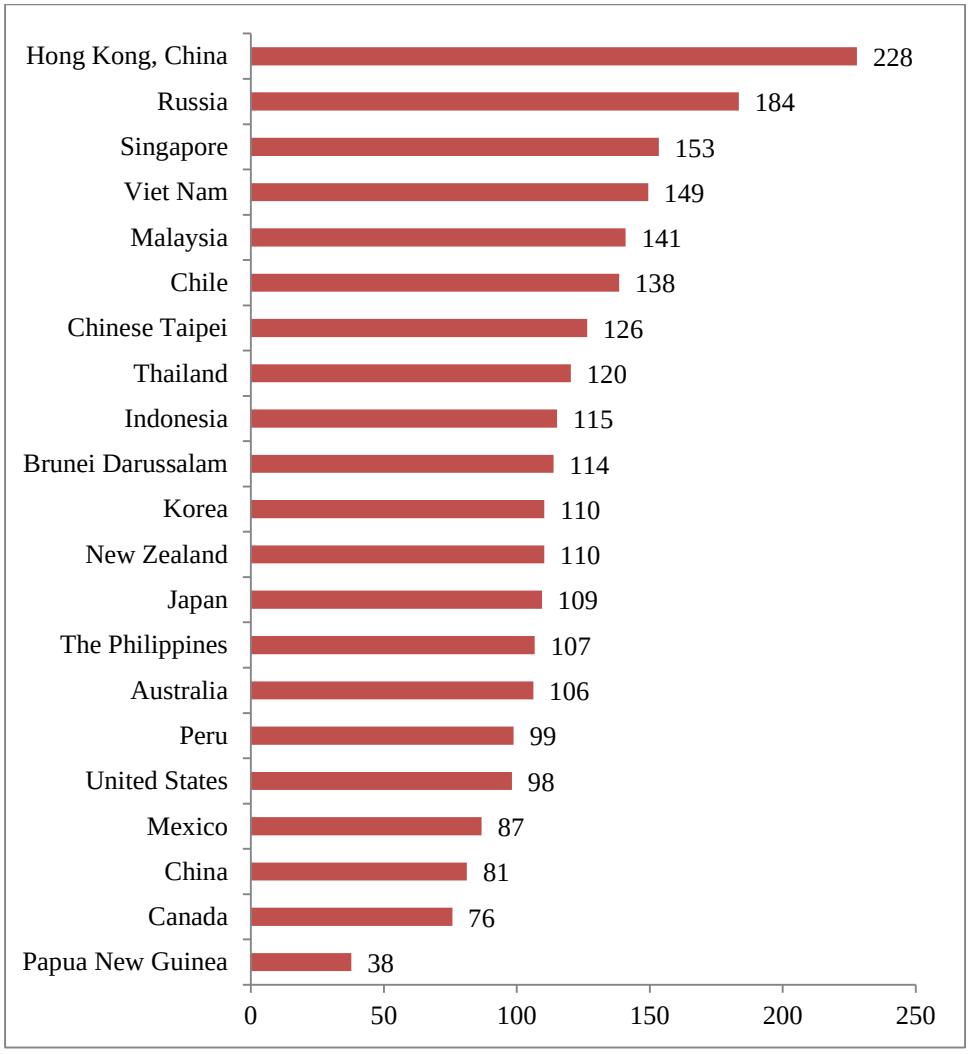


Note on data availability: China – 2009; Indonesia – 2008; Malaysia – 2009; Papua New Guinea - n.a.; United States – 2010; Viet Nam – 2008; all others - 2011.

Source: International Telecommunication Union.

Nevertheless, the Philippines has a mobile cellular subscription density of 107 subscriptions per 100 people in 2012, meaning, mobile subscriptions are greater than the country's population and there are people who are subscribed to more than one mobile carrier. In measuring mobile cellular subscription density, the ITU considers the subscriptions to a public mobile telephone service and access to Public Switched Telephone Network using cellular technology, including the number of active pre-paid SIM cards during the past three months. The ITU definition includes all mobile cellular subscriptions that offer voice communications through either analogue or digital cellular systems. It excludes mobile broadband subscriptions via data cards or USB modems and subscriptions to public mobile data services, private trunked mobile radio, telepoint or radio paging, and telemetry services.

Figure 6. Mobile Cellular Subscriptions per 100 inhabitants, 2012



Source: International Telecommunication Union.

Energy

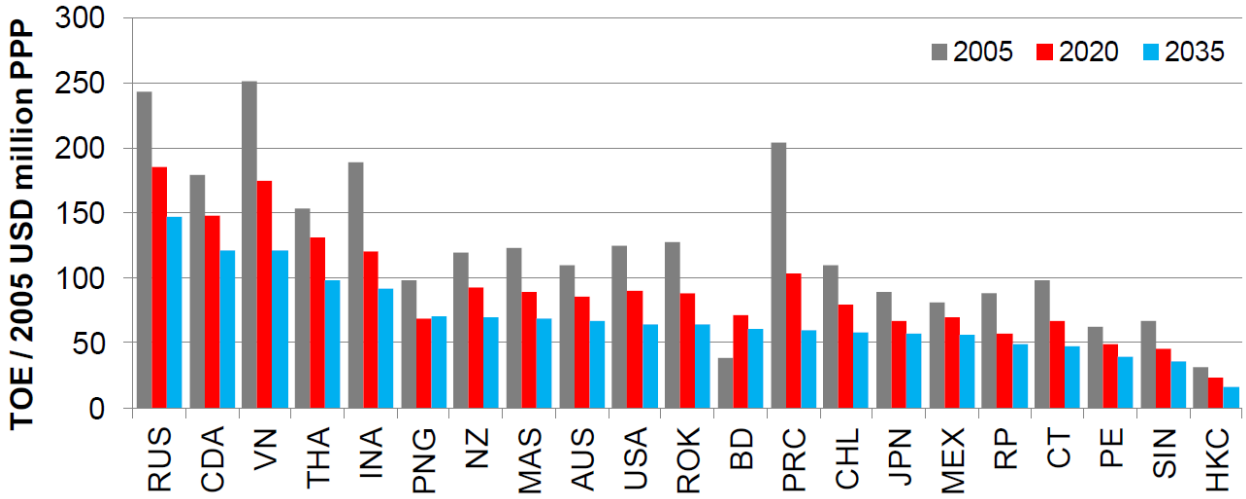
The Asia Pacific Energy Research Centre (APERC) projects that APEC final energy demand[5] will increase from 4,758 million tonnes of oil equivalent (Mtoe) in 2010 to 6,861 Mtoe in 2035, which implies an average annual growth rate of 1.5 percent. China and the US will dominate this demand as together they account for more than 60 percent of demand by 2035. In terms of per capita use, developed economies in APEC tend to use more of every energy source, except new and renewable energy (NRE). Developing economies tend to use more NRE in the form of biomass in the residential sector (APERC 2013).

The APERC's outlook for primary energy supply[6] in the region indicates that, under business-as-usual assumptions, supply will grow from 7,204 Mtoe in 2010 to 10,057 Mtoe by 2035. This implies an average annual growth rate of 1.4 percent (APERC 2013).

Among the strategies of APEC to ensure energy security is to reduce aggregate energy intensity by at least 45 percent by 2035 (with 2005 as base year). Energy intensity is energy consumption relative to GDP, which can be thought of as the energy consumed in order to produce the unit of GDP. It is a measure of overall energy efficiency in an economy. The original aspirational goal, which was set in the 2007 APEC leaders' meeting, was a 25 percent-reduction in energy intensity. This goal was re-set to 45 percent in 2011 when it became evident that APEC as a whole is likely to achieve 25 percent. Projections by the APERC show that the Philippines is likely to meet the 45-percent target by 2035 (Figure 7).

[5] Final energy demand means final (not intermediate) consumption by economic sectors like residential, transport, and others.
[6] The term "primary energy demand" is used interchangeably with "primary energy supply" and emphasizes the fact that demand must equal supply. However, the term "primary energy supply" is customarily used in the energy sector.

Figure 7. APEC Final Energy Intensity per Economy



Source: Asia Pacific Energy Research Center, *APEC Energy Demand and Supply Outlook - 5th Edition* (2013).

The APERC also observes that NRE source development, especially for electricity, is now in the mainstream. This is because many APEC economies are pursuing policies to promote NRE development and technological improvement continues to reduce the cost of NRE. In the Philippines, a feed-in tariff (FIT) policy has recently been adopted and the adoption of renewable portfolio standard is currently being studied. The FIT policy offers guaranteed payments on a fixed rate for renewable energy sources and funding such payments will be through a so-called FIT allowance to be charged to electricity consumers who are being supplied through the transmission network. The renewable portfolio standard, on the other hand, is a policy requiring identified sectors to source a portion of their energy supply from renewable energy sources.

However, the biggest issue in the Philippines is the high price of electricity. The Japan External Trade Organization (JETRO)'s survey of electricity prices in selected cities in Asia and Oceania for fiscal year 2012 show that Philippine cities Manila and Cebu have high electricity prices, which are trailing very close to prices in Japanese cities Yokohama, Chiba and Nagoya, as well as in Sydney, Australia (see Table 4; only 11 APEC members are included in the survey of JETRO 2013). The high price of electricity in the Philippines is very much related to the tightness of supply and the public and private sectors recognize that new investments in generation capacity are needed to address this concern.

Table 4. Electricity Rates for General Use in Selected Cities, 2012

City	APEC Economy	2012 Electricity Rate for General Use per kWh (US$)
Auckland	Australia	0.13
Sydney	Australia	0.28
Hong Kong	China	0.14
Wuhan	China	0.09
Shenzhen	China	0.11
Qingdao	China	0.09
Shenyang	China	0.08
Dalian	China	0.08
Guangzhou	China	0.10
Shanghai	China	0.10
Beijing	China	0.08
Batam	Indonesia	0.06
Jakarta	Indonesia	0.08
Nagoya	Japan	0.26
Yokohama	Japan	0.27
Chiba	Japan	0.27
Kuala Lumpur	Malaysia	0.11
Cebu	Philippines	0.24
Manila	Philippines	0.25
Singapore	Singapore	0.23
Seoul	South Korea	0.07
Taipei	Taiwan	0.12
Bangkok	Thailand	0.11
Danang	Vietnam	0.08
Ho Chi Minh	Vietnam	0.08
Hanoi	Vietnam	0.08

Source: Japan External Trade Organization (JETRO) Survey, 2012

Increasing the stock and improving the quality of Philippine infrastructure can be addressed through more vigorous investments and accelerated institutional reforms. APEC can play a role in this area through regional financing, including public private partnership (PPP) type of financing, and increased regional cooperation on institutional reforms and capacity building. These types of strategies have been recognized several times in various APEC meetings. To illustrate, the 2010 APEC Economic Leaders' Declaration in Yokohama emphasized APEC's convening power to help member economies raise infrastructure financing. Moreover, the 2012 Declaration in Vladivostok encouraged more PPPs in infrastructure. Just recently, the 2013 Declaration in Bali stated that member economies are committed to a Multi-Year Plan on Infrastructure Development and Investment.

IV. Recent Initiatives of APEC Structures on Infrastructure

Within the APEC framework, commitments made by member economies are voluntary and non-binding. Members nevertheless make such commitments because these deliver regional public goods that are able to create positive spill-over effects and shape broader global initiatives. For example, the 45 percent-reduction in aggregate energy intensity by 2035 (relative to 2005 base year) is purely voluntary. Meeting this target without constraining economic growth will be beneficial for a member economy because energy efficiency allows monetary savings, which can then be made available for other purposes like physical and human capital investments.

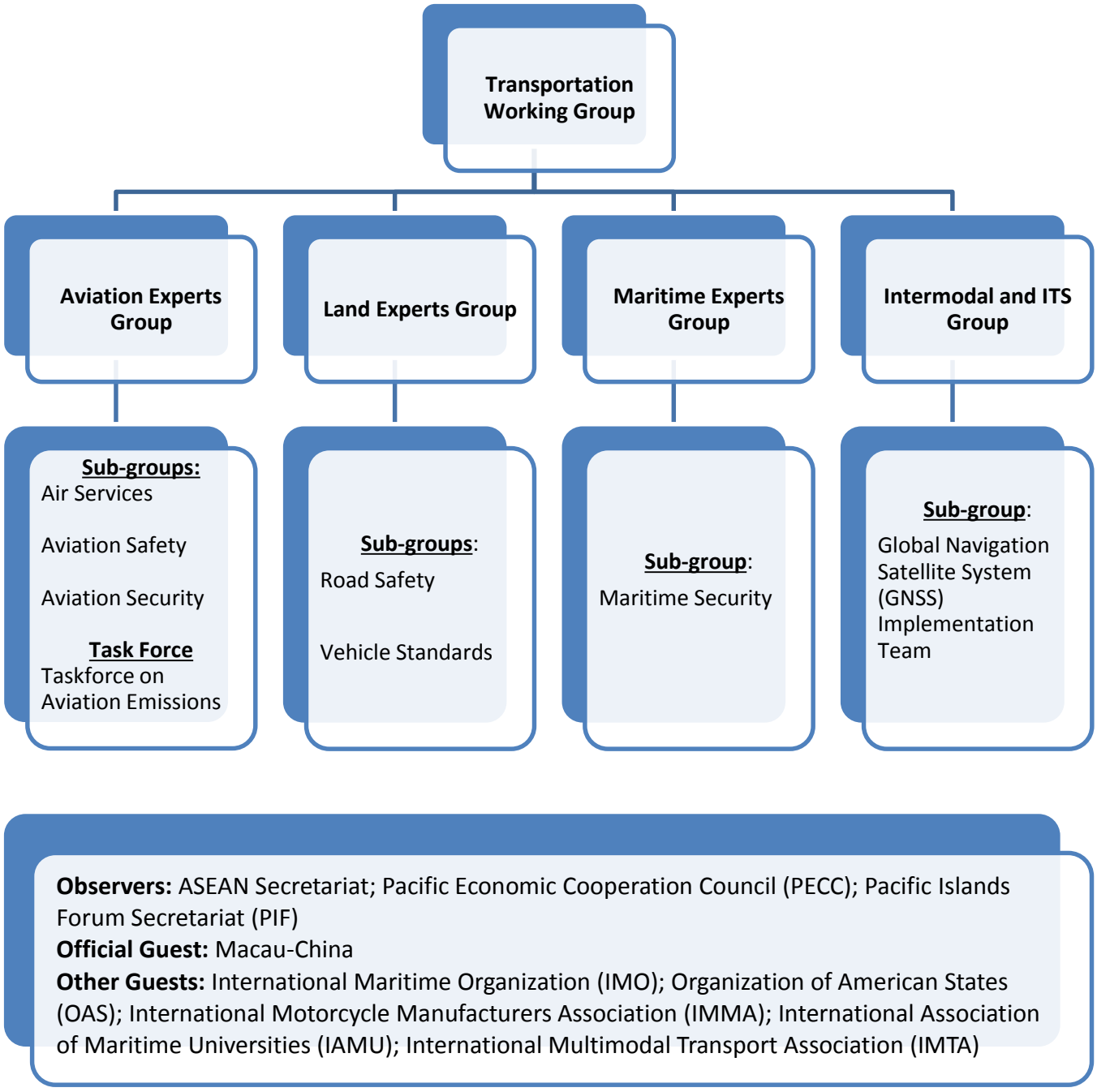
The vehicles for exploring possible areas of cooperation, initiatives and commitments within APEC are formal structures like sectoral ministerial meetings and working groups. Ministers' declarations during sectoral ministerial meetings provide the working groups political guidance and directions regarding key priorities, initiatives and work programs. For infrastructure and physical connectivity, there are working groups on transportation, telecommunications and information, and energy. These structures as well as their recent initiatives are discussed in more detail below.

Transportation Working Group

The Transportation Working Group (TPTWG) is concerned with ways to achieve the efficient and safe transportation of goods and people within the Asia-Pacific region. Its efforts are directed toward balancing the efficiency, safety, and environmental sustainability of APEC transport systems with trade facilitation requirements.

The TPTWG is comprised of four expert groups corresponding to the major modes of transportation: Aviation Experts Group, Maritime Experts Group, Land Experts Group, and Intermodal Experts Group. Each Expert Group also has respective subgroups, as depicted in the organizational structure in Figure 8.

Figure 8. APEC Transportation Working Group Structure



Source: compiled from APEC-TPTWG documents.

Recent initiatives, as formalized in the 8th Transportation Ministerial Meeting in Tokyo, Japan on 05 September 2013, include the following:

On promoting connectivity

> The Transportation Ministerial tasked the TPTWG to create a "Connectivity Map" that will contain the envisioned physical and institutional integration in the region by 2020. It also called for the continued liberalization of aviation markets and recognized the efforts of TPTWG in coming up with documents containing core principles detailing the best practices in aviation and commercial maritime operations. It also encouraged the continued development of each economy on their capabilities for global navigation satellite system (GNSS) interference detection and mitigation.

On enhancing transport infrastructure

> The Transportation Ministerial called on all member economies to upgrade and invest in infrastructure and develop a multi-year plan to improve physical connectivity. It also promoted the use of PPPs and directed the TPTWG to explore opportunities where member economies can share best practices with regards to financing and operations of PPPs.

On sharing of best practices and information

> The Transportation Ministerial asked the TPTWG to develop a "Quality Transport" vision and emphasized the need for knowledge sharing on advanced transportation systems, policy and regulatory measures, innovative technologies, and universal design concepts. It also encouraged the sharing of information and best practices in dealing with national disasters, safety and security, vehicles standard harmonization, and women in transportation.

Among these initiatives, the Philippines can take the following concerns as host country priorities: upgrading and investing in infrastructure, use of PPPs in financing and operating infrastructure,

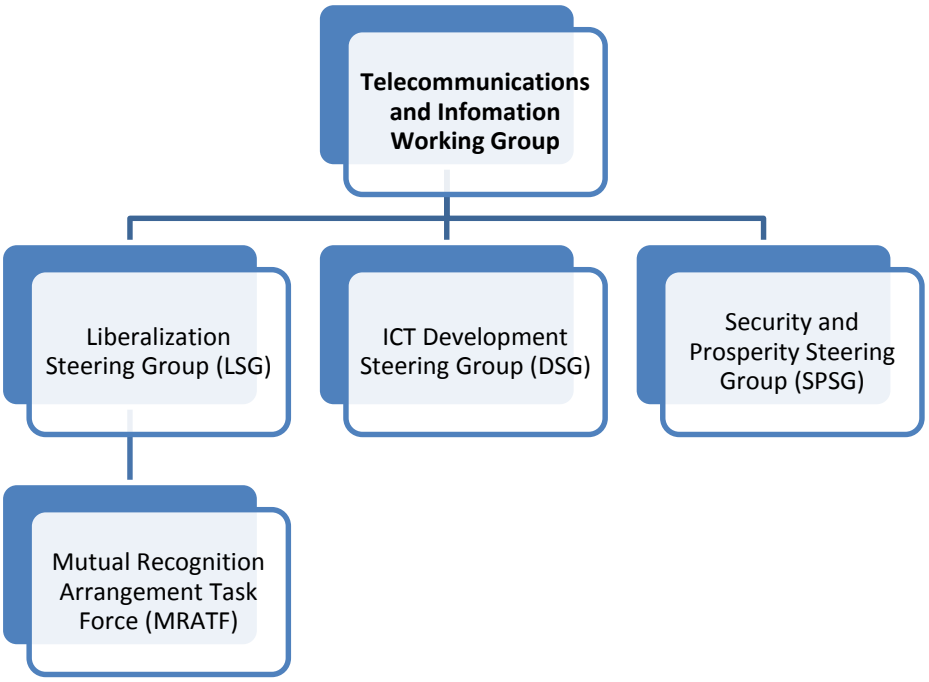
and sharing of best practices in building disaster-resilient infrastructure. These are discussed more fully in Section V, Recommendations on Host Economy Priorities.

Telecommunications and Information Working Group

The Telecommunications and Information Working Group (TEL) aims to improve telecommunications and information infrastructure in the Asia-Pacific region and promote the transition from an Asia-Pacific Information Infrastructure into the Asia-Pacific Information Society. Its strategies include developing and implementing appropriate telecommunications and information policies, including relevant human resource and development cooperation strategies.

The working group has three steering groups—one for liberalization-related policies, another for ICT infrastructure and applications, and another for promoting security and trust in the use of ICT. Under the liberalization steering group is a special task force on mutual recognition arrangement, which was created to implement a mutual recognition arrangement on conformity assessment of telecommunications equipment and to draft a mutual recognition arrangement for equivalence of technical requirements in telecommunications equipment (Figure 9).

Figure 9. APEC Telecommunications and Information Working Group Structure



Source: compiled from APEC-TEL documents.

Among the recent initiatives under the telecommunications and information sector are the following:

On liberalization

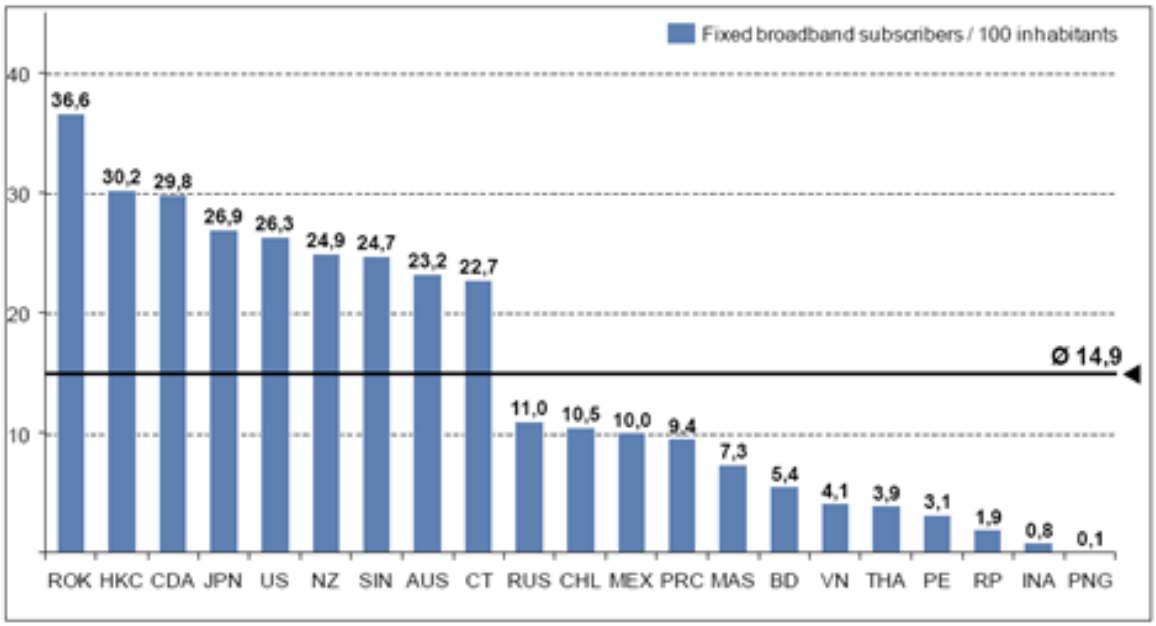
The focus recently has been on the promotion of liberalization of ICT trade and investments. For instance, in order to promote telecommunications equipment trade in the region, mutual recognition arrangements have been prepared. The Telecommunications and Information Ministerial calls on APEC economies to integrate and implement, whenever possible, the Mutual Recognition Arrangement for Conformity Assessment of

Telecommunication Equipment and the Mutual Recognition Arrangement for Equivalence of Technical Requirements.

On ICT development

APEC economies are encouraged to promote best practices in several applications including e-Government, e-Business, and e-Health. In line with this, the ICT Development Steering Group reported in 2013 the expansion of the APEC e-Government Research Center at Waseda University, Japan. Further, Japan and Singapore spearheaded an extension of ICT applications to people with special needs (e.g., disabled and elderly). "Universal Access by 2015" was also endorsed as a target by the Telecommunications and Information Ministerial in 2010. This aims to achieve universal broadband access in all APEC economies by 2015. However, it seems that there is not enough timely information available to verify the pace at which this target is being met because in the 48th TEL meeting in 2013, the report on fixed broadband penetration in the region was still using 2010 data (Figure 10).

Figure 10. Fixed Broadband Density in Asia Pacific, 2010



Source: International Telecommunications Union as cited by APEC ICT Development Steering Group in 2013 TEL Meeting.

On security and prosperity

The recent focus is on building trust in e-commerce and combatting cybercrime, as expressed in the 48th TEL Meeting in 2013. For this purpose, the Security and Prosperity Steering Group has been conducting capacity building workshops covering cybersecurity awareness raising, preventive education on ICT misuse, risk management in the internet economy, as well as dealing with botnets or compromised and illegally controlled computer or robot-networks via the internet.

Other concerns

On **natural disasters**, the Telecommunications and Information Ministerial acknowledges the significant role of ICT in mitigating the impacts of natural calamities and disasters. APEC economies are therefore encouraged to develop ICTs as a disaster response and recovery tool.

On **reduction of roaming costs**, APEC economies are encouraged to explore various ways to reduce telecommunications roaming services. Cost reduction would be beneficial for businesses and consumers and could promote further integration in the region.

It is emerging from the recent direction of APEC efforts in the sector that the Philippines as host member economy can lead the discussions on the use of ICT in disaster prevention, mitigation and response. More explanations on this are offered in Section V.

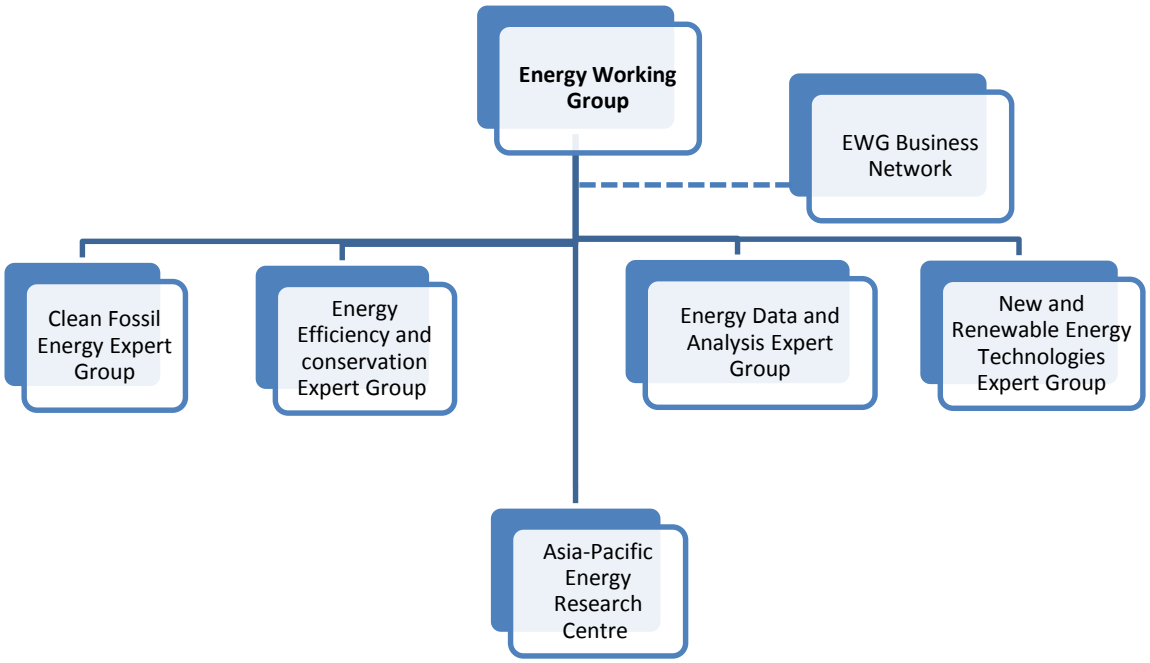
Energy Working Group

The Energy Working Group (EWG) primarily aims to maximize the social and economic benefits received by the Asia-Pacific region from the energy sector. It also aims to efficiently manage the supply and use of energy in the region while mitigating possible adverse environmental effects.

Helping the EWG perform its functions are four expert groups, one each for the following: the use of clean fossil fuels and clean energy technologies, the promotion of energy conservation and the application of energy efficient practices and technologies, the collection of statistics on energy demand and supply and other related information, and the promotion of increased use of new and renewable energy technologies. In addition, the Tokyo-based APERC supports the EWG work through research activities. The APERC's research thrusts are guided by EWG priorities and Energy Ministerial declarations. There is also a public-private sector dialogue mechanism called

the EWG Business Network (EBN). The EBN gives the EWG inputs for energy policy issues from an industry perspective (Figure 11).

Figure 11. Energy Working Group Structure



Source: compiled from APEC-EWG documents.

Recent initiatives include the following:

<u>On the Energy Security Initiative (ESI)</u>

The ESI was instituted in 2001 and is meant to prepare APEC economies for possible energy supply disruptions. Continuing preparations include various joint exercises on oil and gas data gathering, natural gas trade, and oil supply emergency responses.

On the Energy Smart Communities Initiative (ESCI)

The ESCI was launched in 2010 and is composed of four main pillars—Smart Transport, Smart Buildings, Smart Grids, and Smart Jobs and Consumers. The ESCI established a Knowledge Sharing Platform (KSP) in 2011 to serve as a tool for collecting and sharing data and information on the best practices in line with the focus of ESCI. APEC economies are encouraged to disseminate current environmental technologies and energy-saving methods through the KSP. The EWG reported that APEC has made some progress in implementing the four pillars of ESCI through Low Carbon Town Models and that, as of November 2013, there are already three Low Carbon Town Models, which are located in China, Thailand and Vietnam.

On energy efficiency

One of the tools that the APEC is using to promote energy efficiency and thereby achieve its goal of reducing aggregate energy intensity by 45 percent by 2035 is the Peer Review Mechanism on Energy Efficiency (PREE). PREE examines the energy efficiency of a host economy and identify best practices which can be shared to contribute to overall energy efficiency improvement in the region. In line with this, the 2012 Energy Ministerial reaffirmed its commitment to green growth goals including the 45 percent energy intensity reduction.

To reduce gas emissions and dependency of the transport sector on oil, the joint Transport and Energy Ministerial Conference in 2011 also urged member economies to develop energy efficient and sustainable transport systems. These include municipal and railway transportation as well as electronic and fuel-efficient conventional vehicles.

On renewable energy

> An APEC Conference on Clean, Renewable and Sustainable Use of Energy was held in October 2013 to urge APEC economies to take the following actions: boost investments in the clean and renewable energy sector through appropriate government policies, open and transparent regulatory systems and a conducive business environment; build capacity building and engage in technical cooperation in renewable projects that involve appropriate technologies and require skilled human resources; and foster cooperation among APEC members to engage in clean and renewable energy development projects, and decrease energy intensity. At the October 2013 APEC Ministerial Meeting in Bali, Indonesia, the APEC Ministers established the APEC Public-Private Partnership on Environmental Goods and Services (PPEGS). The PPEGS is meant as a forum or dialogue platform and its first meeting is supposed to take place in 2014. Clean and renewable energy is one of the planned topics of the 2014 PPEGS forum.

For the host economy priorities on energy, the Philippines can steer the discussions on energy concerns to include building energy resilience in case of disasters and calamities. At present, discussions on the Energy Security Initiative are focused on energy supply disruptions and oil supply emergency response. But in the case of APEC members with a higher risk exposure to natural disasters such as typhoons and earthquakes, resilience in terms of physical infrastructure is also a significant concern. The Philippines can also solicit the sharing of best practices on tools or policies for ensuring electricity price affordability in a restructured and liberalized industry. These recommendations are discussed in more detail in the next section.

V. Recommendations on Host Economy Priorities

The pace of expanding connectivity within APEC is determined by, among other factors, the level of infrastructure development of each member economy. Advancing infrastructure development

is a very relevant concern for the Philippines since it currently has a low stock and poor quality of infrastructure assets and services relative to those of other APEC members. Moreover, every time a disaster strikes the Philippines, whether from natural calamities or armed conflicts, the country is faced with the daunting task of employing an effective infrastructure network for disaster response and repairing damaged physical infrastructure. Thus, the priorities of the Philippines as host economy for APEC 2015 should be aimed at regional cooperation on investing in good infrastructure, building resilient infrastructure, and sharing of best practices on the effective use of infrastructure during calamities.

The recommendations here on host economy priorities for infrastructure build on past APEC initiatives and at the same time offer fresh ideas on tackling developmental challenges. These recommendations are also consistent with the Philippine Development Plan 2011-2016, which recognizes inadequate infrastructure as a major constraint to inclusive economic growth. Recommendations related to two cross-cutting topics (i.e., cutting across infrastructure sectors) are discussed here—namely, building disaster-resilient infrastructure, and financing infrastructure development through traditional public investment models and PPPs. Additional sector-specific recommendations are also offered.

Building disaster-resilient infrastructure

The socio-economic benefit of building disaster-resilient infrastructure is expectedly high since experience shows, especially in the Philippines, that disasters can cost a significant amount of damage to economic sectors and exact a heavy toll in terms of lost human lives. The avoided cost of reconstruction and rehabilitation plus the avoided loss of human lives (which are difficult to measure in monetary terms) are significant socio-economic benefits of making infrastructure in the Philippines disaster-resilient. The country's experience with typhoon Haiyan in November 2013 demonstrates how high the avoided cost can be.

Super-typhoon Haiyan, with local name Yolanda, hit nine of the country's seventeen administrative regions. The typhoon affected 16,078,181 persons or 3,424,593 families in

12,139 barangays located in 44 provinces, 591 municipalities and 57 cities.[7] The typhoon left 6,300 individuals dead, 28,289 individuals injured, and 1,061 individuals missing.[8]

According to the Reconstruction Assistance on Yolanda Plan prepared by the National Economic and Development Authority (NEDA), the typhoon caused heavy damages and losses to physical infrastructure. These were estimated at PHP33.98 billion or USD772.27 million (using USD1=PHP44 exchange rate). (See Annex 1 for more discussions.)

It is therefore recommended that regional cooperation be sought on building disaster-resilient infrastructure. Particularly, the Philippines can push for technical assistance from developed member economies to disaster-prone member economies. Such assistance should aim to build the capacity of the latter to assess the requirements of, design the plans for, and adopt technologies for disaster-resilient infrastructure.

Sharing of best practices in building disaster-resilient roads, bridges, ports and air transport infrastructure can also be sought. The Philippines can also share lessons learned in complying with infrastructure resilience requirements (e.g., plans, technologies, and logistics for humanitarian activities) from its experience with strong typhoons, earthquakes and other calamities.

Regional cooperation on financing or investing in modern ICT to prevent and respond to disasters can also be sought. The Philippines can also share lessons learned in the effective role of ICT infrastructure on disaster preparedness, such as the Nationwide Operational Assessment of Hazards, or Project NOAH, of the Department of Science and Technology.

In the energy sector, regional cooperation on building energy resilience (in terms of infrastructure and supply) can also be sought. The Philippines can push for sharing of best practices and exchange

[7] NDRMCC. (2014). Situation Report No. 108 dated 03 April 2014. Retrieved from http://reliefweb.int/sites/reliefweb.int/files/resources/NDRRMC%20Update%20-%20Sitrep%20No%20108%20re%20TY%20Yolanda%20-%2003%20April%202014.pdf
[8] NDRMCC update on April 17, 2014. Retrieved from http://www.ndrrmc.gov.ph/attachments/article/1177/Update%20Effects%20TY%20YOLANDA%2017%20April%202014.pdf

of knowledge on construction techniques for disaster-resilient energy infrastructure. The ongoing APEC Energy Security Initiative (ESI) can be a platform for the Philippines' leadership in the discussion of this topic. This is especially important because there are APEC members which face higher risks of natural calamity-induced energy insecurity, and yet the ESI discussions had been dominated for years by topics on energy supply stocking and oil supply emergency response. With respect to supply, the Philippines can push for more knowledge base building on how regional market integration can be an instrument for dealing with emergency situations in the Asia-Pacific region. In the ASEAN region, researches on ASEAN energy market integration are currently being conducted. For instance, possible steps toward a future integrated ASEAN energy market, which can help secure the energy needs of the ASEAN region, are identified in Navarro and Tri Sambodo (2013).

Financing infrastructure development

According to Navarro and Llanto (2013), infrastructure development in the Philippine Public Investment Program 2011-2016 will be financed mostly by the national government. The national government, aided with official development assistance (ODA) loans, will shoulder 67.72 percent of the investment program. Private sector investment will contribute 18.51 percent and investments by government-owned and -controlled corporations (GOCCs) will take care of 8.77 percent. The remaining 5 percent will be shouldered by LGUs, ODA grants, and other sources.

The government needs to improve spending on infrastructure as calculations in Navarro and Llanto (2013) show that in 2008 to 2012, public infrastructure spending as a share of GDP ranged between a low of 1.4 percent to a high of only 2.09 percent. This is still very far from the current administration's target to upgrade the country's infrastructure by spending 5 percent of annual GDP on infrastructure development by 2016.

Recently, the government has been enjoying a wide fiscal space as the fiscal deficit reduction targets have been surpassed for three consecutive years in the current administration. This means more resources for critical government programs and projects. However, sustaining public

investments remains a concern as the government is still a poor performer in terms of revenue generation. Philippine government revenue collections in 2013 (amounting to PHP1,716.1 billion or USD39 billion) was 14.8 percent of GDP, which is low when compared to the average revenue-to-GDP ratio of 18.6 in the ASEAN region (Navarro and Llanto 2014). Thus, other sources of financing including ODA and private sector funds will be needed to ensure the sustainability of infrastructure investments going forward. It is therefore recommended that, in APEC discussions on financing infrastructure, the Philippines raise the topic of augmenting local resources for infrastructure investments with regional resources such as ODA and regional equity funds. Information sharing on best practices on the use of such sources can be pursued.

Among ODA partners for infrastructure loans, Japan has consistently been the biggest source, as indicated by the 2010-2012 data below (Table 5).

Table 5. Infrastructure Loan Amount by Development Partner, 2010-2012 (USD million)

Developing Partner	2010	2011	2012	Total
Japan	2,810.11	2,297.43	2,476.88	7,584.42
France	744.46	721.52	1,181.39	2,647.37
China	1,016.60	1,016.60	297.39	2,330.59
World Bank	496	485.56	761.99	1,743.55
Korea	206.33	219.62	237.66	663.61
Asian Development Bank	31.1	31.1	93.1	155.3
Others	287.09	178.52	137.59	603.2

Source: NEDA Monitoring and Evaluation Staff.

Most of the bilateral sources of ODA loans for infrastructure projects are APEC members and it is expected that these sources will continue to play a significant role in financing Philippine infrastructure investments. China in particular, is contemplating a more active role in infrastructure financing in the Asia-Pacific region through its planned Asian Infrastructure Investment Bank (AIIB), which will have a start-up capital of USD50 billion (Reuters 2014). However, despite the more than one year of news circulation about this plan, important details have not yet surfaced, such as currency risk bearing by borrower countries and improvements in Chinese models on

governance standards and environmental assessments. It is therefore recommended that, in case the AIIB would be raised in APEC meetings, more information on these concerns be raised.

A decreasing trend in Philippine ODA loans for infrastructure has been observed in 2008-2012 (Navarro and Llanto 2013). This is likely related to the fact that the government's fiscal space is improving and some of the infrastructure projects in the public investment program were re-studied and became part of the PPP program. But this is a medium-term trend and it is still necessary to ensure that sources, whether domestic or external, are available to make infrastructure investments sustainable for the longer term.

Given the momentum gained thus far in PPP program implementation, PPPs will be a significant mode of project financing. This implies that the government needs to improve PPP quality, from project-at-entry to contracting and implementation.

The bankability of Philippine PPP projects in the initial pipeline (released in 2010) has been questioned in the past and the challenge of making PPPs bankable remains. Given the Philippine strategy of using PPPs to accelerate infrastructure investments, it is recommended that the Philippines prioritize PPP-related topics in APEC discussions.

To ensure that PPP projects are bankable, the project studies and contract design must sufficiently show that risk sharing between the private partner and the government implementing agency is appropriate and will allow the private partner to have reasonable returns. Demand projections, which are the primary basis of revenue projections, must also be realistic and based on solid assumptions. There must also be safeguards in the proposed contracts for the protection of the rights of the parties involved (e.g., the right to compensation by the private partner if contractually agreed tariff adjustments are disallowed by the government, and the right of the government agency partner to sequester performance bonds and warranties in case the private partner fails in its obligations). In APEC talks, therefore, the Philippines can drive the PPP-related discussions by expressing the need for more sharing of knowledge and best practices on appropriate risk allocation and contract design, management and monitoring. Moreover, the Philippines can ask for regional cooperation on sustained, dynamic and productive capacity building assistance for

PPP units in less advanced APEC members so that they can generate a pipeline of bankable infrastructure PPPs. Since knowledge on PPPs is not static, capacity building should be dynamic.

Other recommendations

The Philippines can also raise the following additional recommendations:

On transport

Regional cooperation will be needed in terms of knowledge-sharing and actual investments on upgrading maritime safety standards, expanding air transport capacity and improving the quality of air transport services. Such efforts are necessary given that our maritime safety record is poor and our air transport network is in dire need of capacity expansion and improvements (e.g., Communications, Navigation and Surveillance/Air Traffic Management Systems and night landing capabilities).

On telecommunications and information

Regional cooperation can also play a role in facilitating investments to increase the capacity of Philippine broadband infrastructure. Note that for this, the relevant regional sources of financing for capital investments in the sector are equity funds and commercial credit rather than ODA because the Philippine telecommunications industry is private sector-led and Republic Act 8182 prohibits the use of ODA for telecommunication projects. The Philippines can also solicit best practices sharing on the optimum utilization of broadband technologies, especially given that additional capacity from the Brunei Darussalam-Indonesia-Malaysia-Philippines East Asean Growth Area (BIMP-EAGA) submarine fiber optic cable is expected. The BIMP-EAGA submarine fiber optic cable project is currently ongoing (Brunei Times 2014).

On energy

The Philippines must support the continuing efforts to attain an energy-efficient APEC because of the positive implications of these to energy supply stability (i.e., any saving in energy consumption is additional energy supplied to the energy system). The Philippines can also take the lead in discussing the difficult challenge of responding to public calls for maintaining electricity price affordability in a restructured and liberalized environment. It can recommend knowledge sharing on how advanced member economies, which already have a long experience in electric power industry liberalization, ensure the affordability and reasonableness of electricity tariffs and design policies and rules that minimize price spikes in electricity markets. There could be significant lessons to be learned from these member economies given their long historical experience in the design, implementation and continuous refinements of electricity industry policies and electricity market rules. The contribution of this initiative to the Philippines may be significant since one of the major problems in the domestic electric power industry is the high price of electricity.

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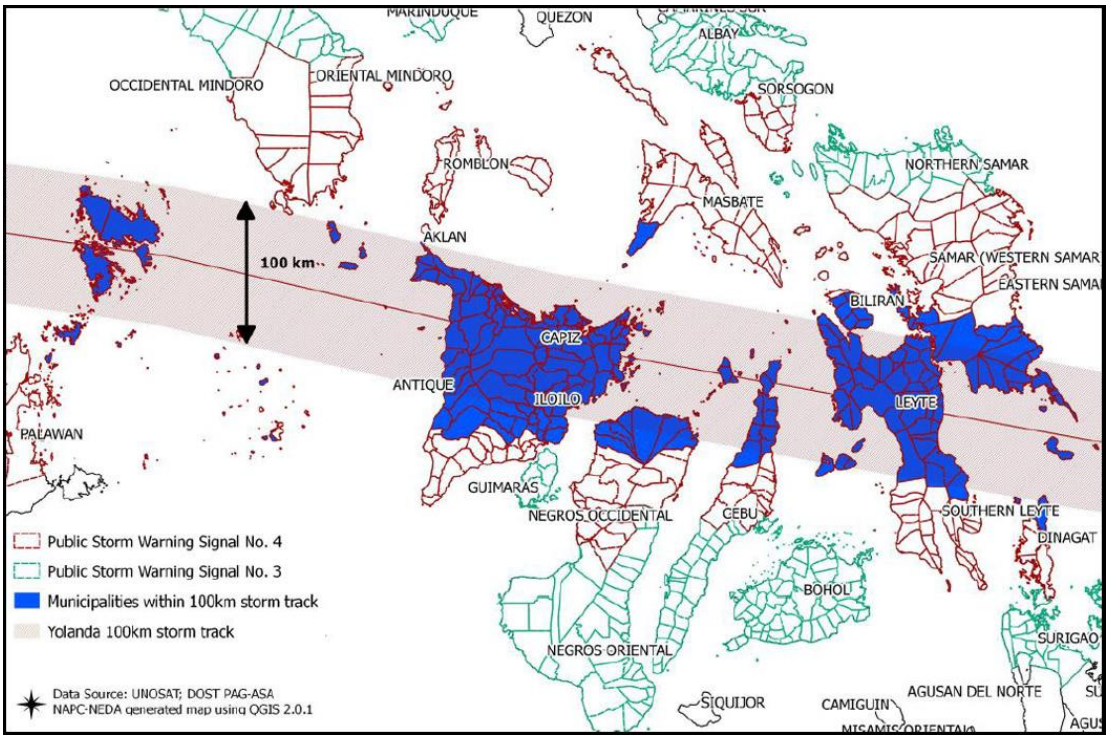
Annex 1 - Damage to Infrastructure in the Aftermath of Super-typhoon Yolanda

Summary from the NEDA Reconstruction Assistance on Yolanda (RAY) Plan

Super-typhoon Yolanda, with international name Haiyan, hit nine of the country's seventeen administrative regions. The typhoon affected 16,078,181 persons or 3,424,593 families in 12,139 barangays located in 44 provinces, 591 municipalities and 57 cities.[9] Figure A1 below shows the areas along the path of Yolanda.

Figure A1. Track of Typhoon Yolanda



Source: NEDA. 2013. RAY Plan.

[9] NDRMCC. (2014). Situation Report No. 108 dated 03 April 2014. Retrieved from http://reliefweb.int/sites/reliefweb.int/files/resources/NDRRMC%20Update%20-%20Sitrep%20No%20108%20re%20TY%20Yolanda%20-%2003%20April%202014.pdf

The typhoon left 6,300 individuals dead, 28,289 individuals injured, and 1,061 individuals missing.[10]

On 16 December 2013, the National Economic and Development Authority (NEDA) released the Reconstruction Assistance on Yolanda (RAY) Plan. According to the report, Yolanda caused heavy damages and losses to the following sectors: physical infrastructure, PHP33.98 billion; agriculture, PHP62.11 billion; industry and services, PHP116 billion; education, PHP23.9 billion; health, PHP5.57 billion; housing, PHP325.24 billion; and local government, PHP4.3 billion. About 90 percent of the total damages and losses were borne by the private sector, and the remaining 10 percent by the public sector.

With respect to infrastructure, the following summarizes the damages, losses, and recovery and reconstruction needs of the different sectors.

Table A1. Damages, Losses and Recovery and Reconstruction Needs - by Infrastructure Sector and Type of Ownership

Sector	Damage and Loss (PHP million)					Needs[11] (PHP Million)		
	Damage		Loss		Total	Recovery	Re-construction	Total
	Public	Private	Public	Private				
Infrastructure sectors	**16,024.30**	**4,285.00**	**7,108.40**	**6,565.40**	**33,983.00**	**3,654.90**	**24,670.90**	**28,325.80**
Electricity	5,329.30	1,500.00	4,575.20	4,126.40	15,530.90	1,740.30	8,195.20	9,935.50
Roads, bridges, flood control and public buildings	4,255.20	-	322.9	-	4,578.10	64.60	5,106.20	5,170.80

[10] NDRMCC update on April 17, 2014. Retrieved from http://www.ndrrmc.gov.ph/attachments/article/1177/Update%20Effects%20TY%20YOLANDA%2017%20April%202014.pdf

[11] The report noted that the estimates of needs are based on submissions from national government agency-led sector teams. In some cases, adjustments were made to fully reflect the costs of addressing estimated damage and loss, e.g., by integrating disaster resiliency standards into the reconstruction needs of some sectors, by providing for a higher allocation to address the estimated income losses in the agriculture enterprise sectors, and by taking account of additional needs for social protection.

Sector	Damage and Loss (PHP million)					Needs[11] (PHP Million)		
	Damage		Loss		Total	Recovery	Re-construction	Total
	Public	Private	Public	Private				
Ports and airports	6,010.80	216	24.3	-	6,251.10	-	7,472.10	7,472.10
Water and sanitation	429	2,569.00	2,186.00	2,439.00	7,623.00	1,850	3,897.4	5,747.4

Source: NEDA. 2013. RAY Plan.

Electricity

Damage to electric cooperatives (ECs) accounted for almost 76 percent of the total damage to the energy sector. Of the 33 ECs that were affected by Yolanda, 12 were totally damaged and 21 were partially damaged. Four ECs located in Leyte suffered the most damage and accounted for 52 percent of the total damages.

According to the National Grid Corporation, the PHP1,500 million worth of damages consisted of damages to 248 transmission towers, 376 electric poles, and seven substations. The National Power Corporation's off-grid facilities suffered a minor overall damage of PHP7.26 million. But the damage caused by its Power Barge 103, which was ripped from its mooring site along the Estancia coastline and forcefully rammed onto the shore, amounted to PHP117.2 million.

The losses of the private sector were estimated to be about five times those of the public sector. Preliminary assessments showed overall losses at approximately PHP8,700 million, with 88 percent attributed to the distribution subsector. These significantly higher losses were mainly due to the loss of income of the 33 ECs when their approximately 760,000 residential customers lost connections. The Unified Leyte Geothermal Power Plant complex also lost substantial revenues amounting to PHP1,000 million.

Roads and bridges

Below is the summary of physical damages to roads and bridges:

	National Total (in km)	Physical Damage caused by Yolanda	
		in km	in percent
National Primary Arterial Roads	16,056	6,728	42%
National Secondary Roads	15,541	5,583	36%
Bridges	7,928	3,357	42%

Source: NEDA. 2013. RAY Plan.

Ports and airports

Ports. There are 118 ports in Regions IV-B, V, VI, and VIII, 62 of which are administered by the Philippine Ports Authority (PPA), 51 are municipal ports and 5 are feeder ports under the Department of Transportation and Communications. In addition, there are 63 ports in Region VIII under the Cebu Ports Authority. Damages to ports were estimated at PHP515.6 million. While the PPA ports were reported to be partially damaged and operational, the lighter structures of the municipal ports were severely damaged and no longer operational. Port loss was estimated at PHP24.3 million.

Airports. Of the 40 airports in the affected area, one is classified as an international airport, eight are trunkline airports, 16 are secondary airports, and 15 are feeder airports. Damages to airports are estimated at PHP5,697.8 million. Tacloban Airport suffered significant damage as it was inundated by the storm surge. Other airports within the storm's path, including Ormoc, Kalibo International, Busuanga, Guiuan and Roxas airports, also had considerable damage.

Water Supply and Sanitation

According to the Local Water Utilities Administration (LWUA), there are 70 water districts (WDs) serving piped water supply to 91 of the affected local government units (LGUs). Of the 70 WDs, 67 were affected by the typhoon. The damage suffered was relatively minor and usually limited to the above-ground structures and equipment, water sources, reservoirs and transmission pipelines. The major below-ground infrastructure (i.e., water distribution networks) was generally undamaged. Areas of the LGUs that are not covered by WDs are provided water through LGU-run water utilities. Based on feedback from most of these LGUs, only 19 utilities reported damage to their water supply systems and the damage estimates were relatively low. Shallow wells and pumps administered by barangays or community/water user groups also suffered damages. Total damages to water supply and sanitation infrastructure were estimated at PHP2,998 million, PHP2,569 million of which are due to damage to private connections and equipment loss.