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Seizing greenfield infrastructure opportunities in ASEAN

Infrastructure Series Report 2

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Contents

Foreword

Infrastructure development is crucial to improving connectivity and driving sustainable growth in ASEAN. It is important to identify the changing needs of each of these countries in order to leverage future opportunities and trends in infrastructure investments in the region.

This report is the second in a three-part Infrastructure Series. In the first report, *Understanding infrastructure opportunities in ASEAN* (2017), we discuss the existence of a widening infrastructure gap in the region, highlight the potential difficulties faced by countries in mobilising infrastructure investments, and examine measures that could potentially address these challenges. In addition, we introduce the future drivers that we believe will further increase infrastructure spending in the region.

In this second report, we take a closer look at how the identified drivers are shaping the pipeline of greenfield infrastructure projects in each ASEAN country. We also assess how the Public Private Partnership (PPP) project pipelines of these countries are shaping up in light of these driving forces.

The subsequent and final report of our Infrastructure Series, which will be published later in 2018, will cover infrastructure funding and financing, including developments in the funding landscape and alternative sources of financing.

We hope that you find our Infrastructure Series a useful resource that addresses some of the key issues that we as infrastructure practitioners grapple with. If you would like to discuss any of the issues raised here, please do get in touch with us.

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Methodology

Our comments and analysis are based on data obtained from industry recognised sources. We also built on PwC's significant research and findings included within the first report in this Infrastructure Series, *Understanding infrastructure opportunities in ASEAN* (2017). We supplemented these findings with independent research to provide a holistic view of the topic. Furthermore, we have also included case studies and examples, where relevant, to illustrate the trends observed.

Lastly, we would like to highlight that as this report relies on third-party project databases such as Business Monitor International Research (BMI) and InfraPPP World, any assumptions that form the basis of the project databases do apply to this report as well.

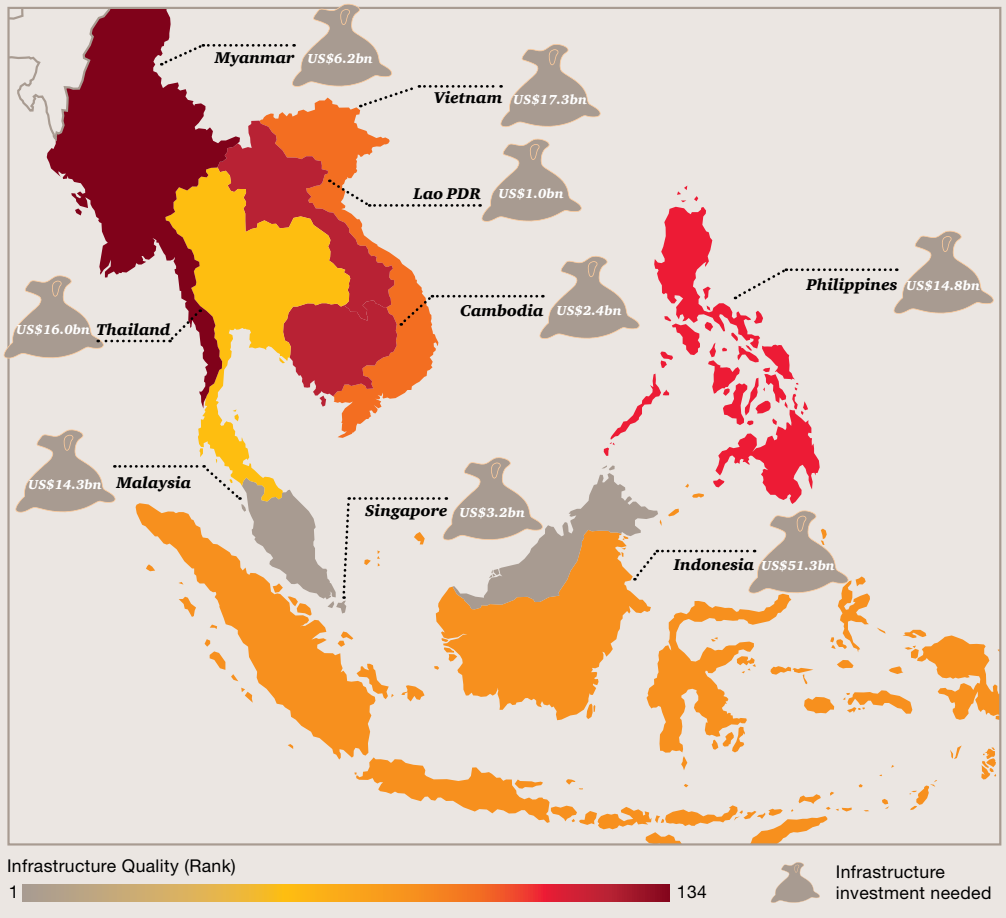
Chapter 1: Infrastructure in ASEAN

An overview

All economies in ASEAN have been focusing their efforts on increasing both private and public sector investments in infrastructure. However, the region's rapid growth has outpaced its infrastructure development, which has resulted in a huge need for infrastructure investments.

The Asian Development Bank (ADB) estimated that ASEAN countries will require US$2.8 trillion in infrastructure investments from 2016 to 2030. Based on estimates by the Global Infrastructure Hub, Figure 1 sets out the infrastructure investment required in each country in 2017.

Figure 1: Infrastructure overview



Source: Global Competitiveness Index, World Economic Forum; Global Infrastructure Hub; Asian Development Bank (ADB) Institute (ADBI)

Notes

Infrastructure Quality ranking - This is the infrastructure component under the Global Competitiveness Index that measures physical infrastructure quality (such as roads, railroad, port, air transport, electricity supply, and more). The data is based on the Global Competitiveness Index Report 2016-17, except for Myanmar, which is based on the 2015-16 report.

Infrastructure Quality - This is depicted by the colour of each country in Figure 1 – a darker shade of grey indicates higher quality infrastructure while a darker shade of red indicates otherwise. The transition from one colour to the other is set at a rank level of 50.

Infrastructure investment need - A forecast to demonstrate the investment that would need to occur if countries were to match the performance of their best performing peers, after controlling for differences in the characteristics of the country. The data is based on information provided by Global Infrastructure Hub in 2017. Data for Lao People's Democratic Republic (PDR) is based on ADBI's report, *Infrastructure investment needs in the Lower Mekong 2010-2020.*

In the first report of this Infrastructure Series, we shared the drivers that we see contributing to increased infrastructure requirements in the region (Table 1).

Table 1: Summary of drivers of infrastructure spending

Driver	Impact on infrastructure investment
Population change	
Urbanisation	ASEAN's emerging economies are experiencing a very high rate of urbanisation, which is creating greater population density in cities and giving rise to issues such as congestion, electricity cuts and pollution. This, in turn, is leading to an increased demand for transport networks, utilities and waste management. As cities grow, more investment needs to be made in efficient transport networks to reduce reliance on private vehicles. Utilities and public services also need investment to satisfy a growing number of urban residents and improved waste management facilities are required to deal with waste generated by inhabitants in a sustainable manner.
Demographic and social change, including ageing populations	Rising wealth, changing demographics and increasingly sophisticated lifestyles in ASEAN will fuel demand for more spending on social infrastructure. Capital will need to be allocated to develop education facilities, healthcare centres and urban governance services such as e-governance systems. Presently, social infrastructure spending sits lower on the investment agenda as countries focus on economic infrastructure to boost growth. However, there is clearly room for more investments in the social space and the need for investment in this sector is only likely to increase.
Increase in mobility, increased demand for transportation	Increasing prosperity leads to, among other things, a greater demand for car ownership. This in turn leads to congestion and economic inefficiencies if road networks are not expanded and/or improved. In addition to increased spending on road infrastructure, economies also need to invest heavily in other forms of transport infrastructure — commuter rail, high speed rail, and urban rail are necessary to allow for the effective movement of goods, raw materials, and people. Ports and airports remain a key part of transport networks in a geographically fractured region.
Geopolitical and environmental factors	
Trade competitiveness	As countries become more engaged in global production networks, investing in infrastructure upgrades to facilitate trade bears greater significance. The quality of infrastructure within a country plays a major role in the trade costs incurred when engaging in trade, thus affecting the trade competitiveness of countries. ASEAN economies also share important trade links with one another. With increased demand for goods from consumers both within and beyond ASEAN, there would be a corresponding development of regional supply chains, leading to a need for infrastructure to improve connectivity within and between countries in the region. In addition to transport networks, infrastructure supporting access to, and transmission of, power would also be critical in facilitating economic production and trade.
Climate change and resource scarcity: the need for sustainable infrastructure	With rapid economic growth and its overarching impact on climate, there has been a corresponding global emphasis on sustainable development. This has contributed to the demand for sustainable infrastructure in the region. For instance, of the 17 Sustainable Development Goals (SDGs) adopted by world leaders during the September 2015 United Nations Sustainable Development Summit, Goal 7 speaks of ensuring "access to affordable, reliable, sustainable and modern energy for all". This has in turn created a demand for the generation of clean energy through solar farms, wind farms and hydropower plants.

Shifts in global economic power	It is widely acknowledged that global economic power is shifting fast to the east. Economic powerhouses like China and Japan are proactively looking at expanding their footprint across the region and to further connect themselves with the global economy through government-to-government collaborations, as well as regional and cross-regional projects. A clear example of this is China's Belt and Road Initiative (BRI). The emphasis is on improving global connectivity to bolster trade and this has resulted in funds flowing towards infrastructure assets, especially transport and power.
Disruption	
Technological breakthroughs	Technological breakthroughs impact every industry. In the infrastructure sector, it transforms the way infrastructure is procured, built and operated, and has major implications on enablers throughout the lifecycle of infrastructure projects. One of the major trends that is likely to impact infrastructure in ASEAN is the rise of smart cities and grids.
Communication needs	Telecommunication capability is becoming increasingly important as businesses rely on their employees' ability to talk to colleagues, customers and suppliers both on a global basis and in a timely manner. Cities and countries that can implement fast and reliable wired and wireless communication networks stand to gain a competitive advantage over their geographical neighbours. This has the dual benefit of increasing workforce productivity and attracting new companies to establish operations in a city or country.

These drivers were analysed in the first report of our Infrastructure Series where we discussed the state of play of the infrastructure sector in ASEAN. In this report, we will build on our earlier analysis to explore how the identified drivers have affected the pipeline of infrastructure projects in the region.

Chapter 2: Key sectors and the opportunities within

For the purpose of our sectoral analysis, we sourced a list of infrastructure projects and their status from BMI*. We focused on four overarching sectors within the 10 ASEAN countries, as set out in Table 2.

Table 2: Sector definitions

Sector	Sub-sectors
Energy	• Non-renewable energy power plants (such as coal and gas) • Oil and gas pipelines • Renewable energy power plants (including biomass, geothermal, hydro, solar, and wind) • Grid infrastructure
Social	• Education • Healthcare • Others (such as prisons and correctional institutes)
Transport	• Airports • Ports • Rail • Roads and bridges
Utilities	• Water (such as treatment plants, sewerage systems, desalination plants, water supply projects and dams)

This report further classifies the status of each project into Past (2005 to 2017) and Pipeline, as defined in Table 3.

Table 3: Definition of past and pipeline projects

Status	Description
Past	Past projects are defined as those where: • Financial close has been achieved; or • Construction is in progress or complete
Pipeline	Pipeline projects are defined as those where: • Planning of the project is underway; or • Feasibility studies or Environmental Impact Assessment (EIA) are in progress; or • Tender has been launched; or • Project has been approved; or • Contract has been awarded

*Data as of 25 October 2017

The BMI database includes a list of over 900 past projects and 800 pipeline projects in ASEAN.

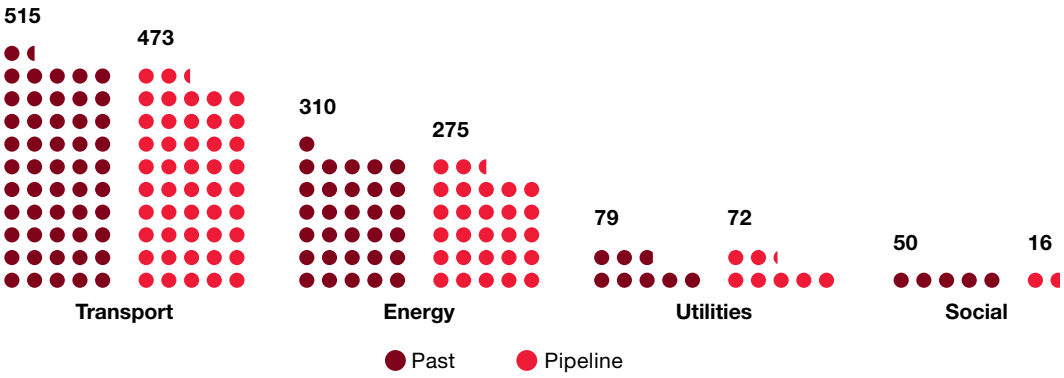
Categorising the projects into the four abovementioned sectors, it becomes clear that transport has dominated infrastructure development in the past and the focus on this sector is set to continue. It is a similar story for energy.

Comparatively, the utilities and social sectors seem to be lower in priority for ASEAN countries. However, with increasing urbanisation, an ageing population and an increasing disease burden, we believe these sectors will soon start receiving more attention from governments.

For a better understanding of the trends within the transport and energy sectors, we drill down to a more granular level in the following sections.

It is important to note that a number of projects in the various sectors and countries may have been identified but remain unbankable – as noted in the first report of our Infrastructure Series, a lot more needs to be done by regional governments to properly prepare projects, and get them ready for market.

Figure 2: Number of past and pipeline projects by sector

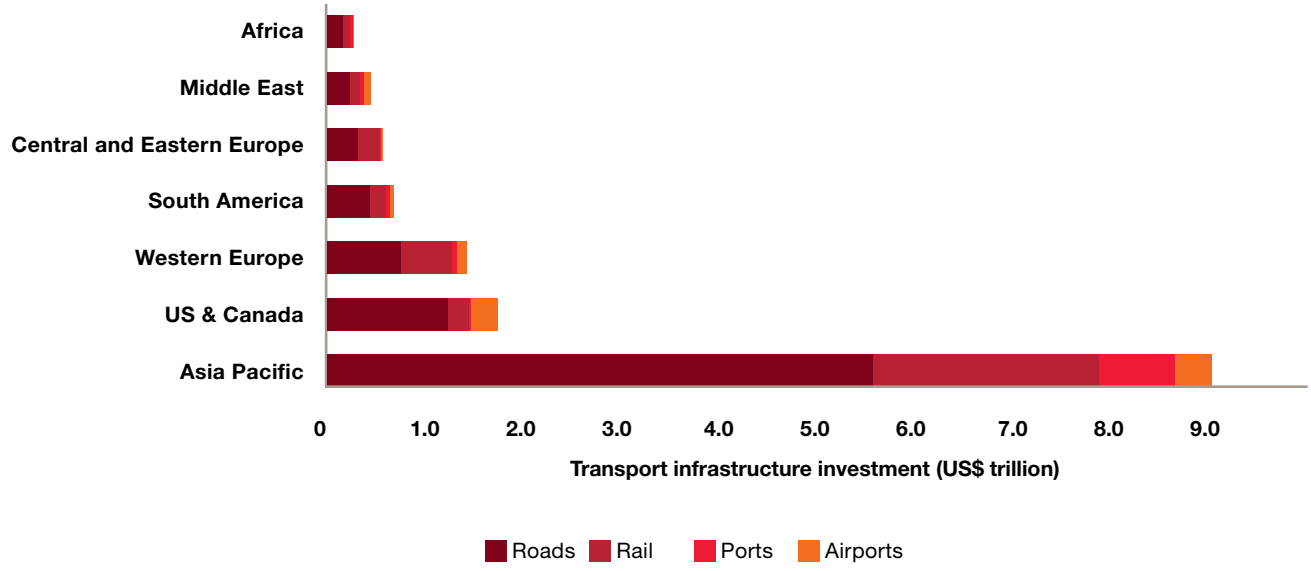


Source: BMI

Transport

Asia Pacific is forecast to become the largest transport infrastructure market in the world with investments expected to increase from US$669 billion in 2016 to nearly US$1.2 trillion in 2025[1]. Cumulatively, investments in transport infrastructure in Asia Pacific are expected to be almost US$9.0 trillion (Figure 3). This is due to the region's diverse and difficult geography, rapid economic growth and increasing urbanisation, all of which culminates in an acute need to develop transport infrastructure and services.

Figure 3: Cumulative transport infrastructure investment between 2016 and 2025



Source: PwC analysis; Oxford Economics

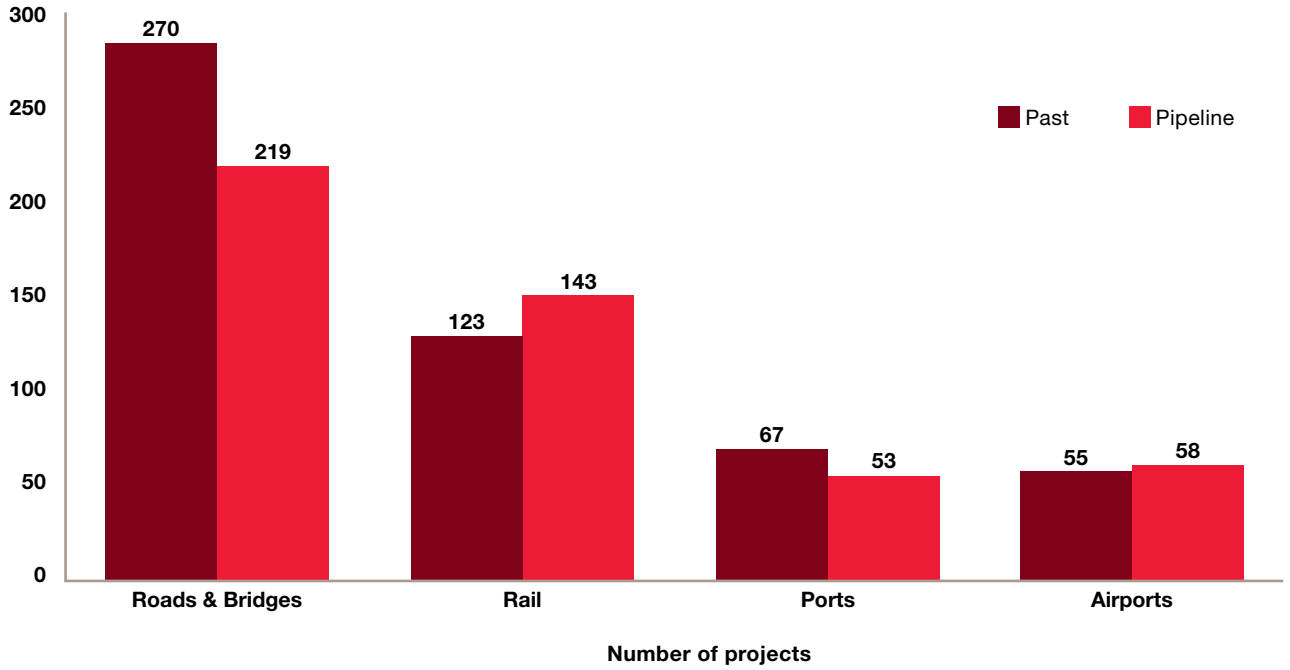
Governments get ambitious

Governments in the region have identified transport infrastructure to be of strategic importance for their economic development and trade competitiveness. Given the rapid urbanisation and increasing mobility that many ASEAN countries are seeing, demand for transport infrastructure and more efficient transport networks is on the rise. This has placed pressure on governments to renew a commitment to transport infrastructure spending as part of their national development strategies.

Historically, there has been a focus on roads and bridges. Presently, 65%[2] of projects under construction are roads and bridges. There were a total of 270 road and bridge projects in the past, accounting for more than 52% of the total transport projects[3]. This emphasis is set to continue — of the total number of transport projects in the pipeline, 46% are roads and bridges, and 30% are rail (Figure 4).

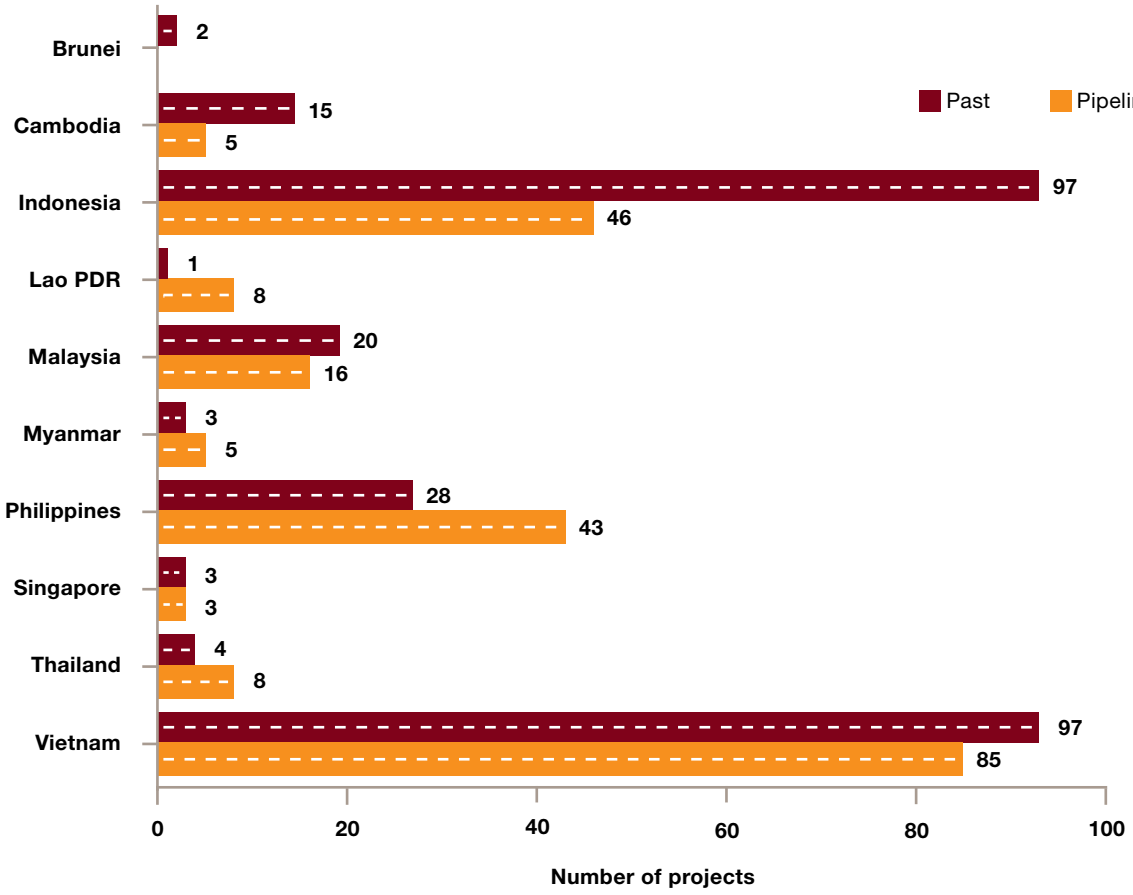
[1] PwC analysis; Oxford Economics; Capital Project and Infrastructure Spending: Outlook to 2025, PwC, 2014
[2] BMI
[3] Ibid

Figure 4: Number of transport projects by sub-sector (past vs pipeline)



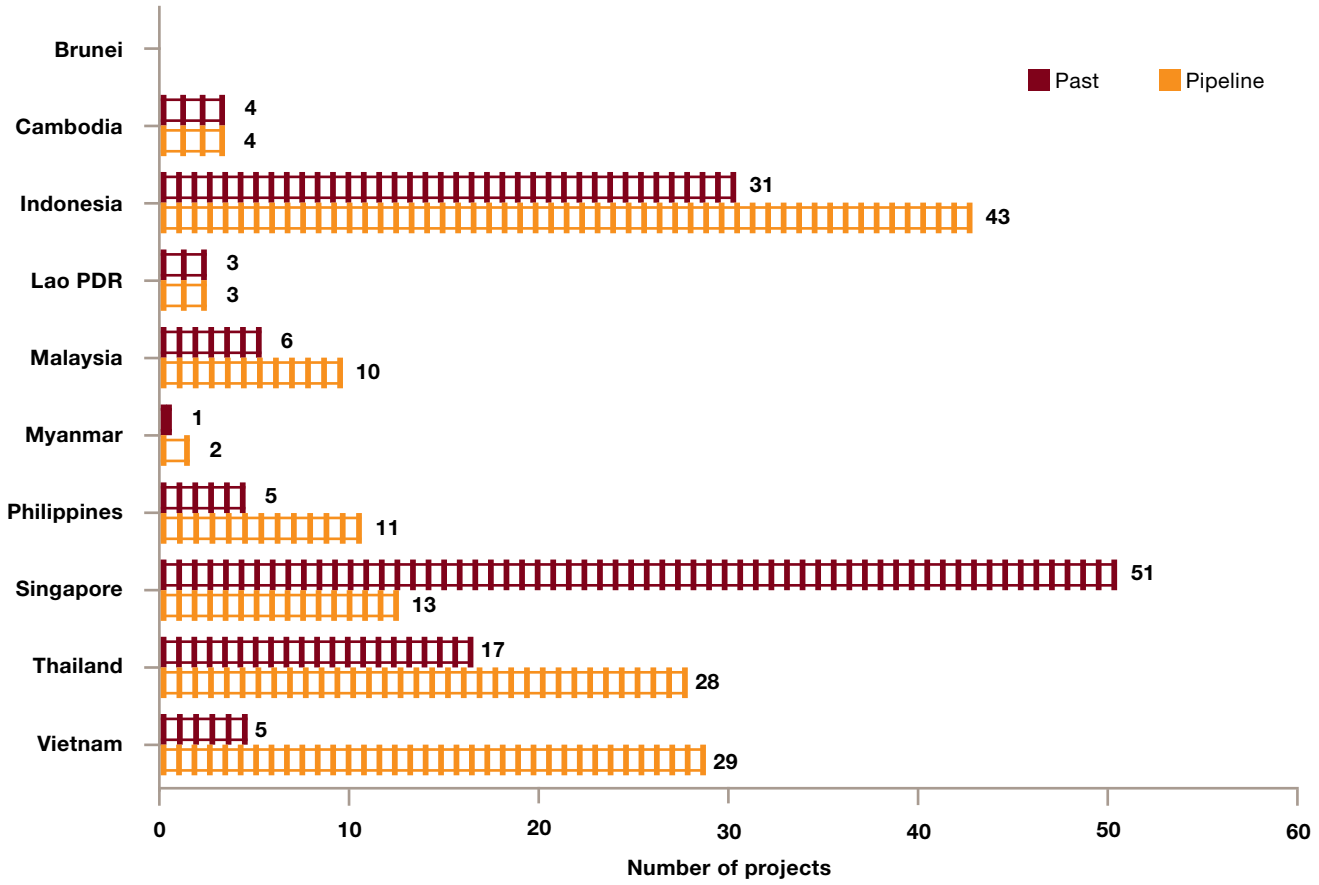
Source: BMI
While it may appear to be a downward trend in terms of the number of projects, it should be noted that the number of years in each period are different.

Figure 4.1: Number of road and bridge projects by country



Source: BMI

Figure 4.2: Rail projects by country



Source: BMI

Among the ASEAN countries, Indonesia, Vietnam and Philippines have historically had the largest share of transport infrastructure projects. In fact, Vietnam and Indonesia share the top spot with 97 projects each.

In Vietnam, road is the dominant mode of freight transport supporting the country's development as a regional manufacturing hub. Statistics show that roads served about 77% of all freight transport and 94% of all passengers transported in 2016[4].

These countries intend to continue their emphasis on transport, as observed from their development plans. Thailand, too, has unveiled infrastructure plans that place emphasis on transport infrastructure.

Vietnam's Socio-Economic Development Plan (SEDP) 2016-2020

The SEDP is Vietnam's medium-term development plan which identifies key objectives for the country. Under the SEDP 2016-2020, investments identified include:

- US$48 billion for transport infrastructure projects between 2015 and 2020
- US$13 billion for a 10-lane road spanning 1,800km between Hanoi and Ho Chi Minh City
- US$409 million for 4,000 small bridges (such as suspension bridges) between 2016 and 2021

Indonesia's National Medium-Term Development Plan (RPJMN 2015-2019)

The RPJMN 2015-2019 was published in January 2015. It contains general strategies and policies relating to national development, priority programmes of ministries, institutions and inter-institutional programmes as well as regional and inter-regional programmes. The Indonesian government has identified priority national strategic projects under the RPJMN 2015-2019 in the road and rail sector. Under the RPJMN 2015 - 2016, US$460 billion is expected to be invested for the construction of transport infrastructure including 5,000km of railways, 2,600km of roads and 1,000km of toll roads.

[4] General Statistics Office of Vietnam

Philippine Development Plan 2017-2022

The Philippine Development Plan 2017-2022 is the first medium-term development plan to be aligned with a long-term vision of attaining inclusive economic growth in the country and eventually transforming the Philippines into a knowledge economy through increased innovation.

One of the sectors identified by the government is transport infrastructure, including roads and bridges, ports, airports, vehicles, transport systems, and communication, and a US$71.8 billion development plan for the next five years was announced in 2017.

Thailand's Transport Infrastructure Development Plan 2015 – 2022[5]

Thailand's transport plan aims to reduce the cost of logistics and transportation, which is expected to improve its economic competitiveness. The goal is to turn Thailand into a key logistics hub in the ASEAN Economic Community. The plan consists of five key programmes:

1. Inter-city rail network
2. Capacity enhancement for highway network to link key areas in the country and neighbouring countries
3. Public transportation network development plan for Bangkok Metropolitan Region
4. Air transport capacity enhancement
5. Maritime transport development

The Thai government has taken action by approving transport infrastructure plans including:

- A US$51 billion plan for 2016; and
- A US$25 billion plan for 2017

Joining hands, regionally and cross-regionally

While many ASEAN countries are looking inward at their infrastructure needs, they remain acutely aware of their place in the wider global supply chain. Shifts in global economic power and trade competitiveness are driving regional cooperation and integration initiatives. Global and regional megaprojects arising from this trend, such as China's BRI and the initiatives announced for the Greater Mekong Subregion (GMS), will boost infrastructure spending, particularly in ASEAN.

Belt and Road Initiative

The BRI announced by the Chinese government aims to establish connectivity between China and the rest of Asia, Europe and Africa.

A key area of this initiative is to develop a transport network connecting China to other Asian countries, Europe and Africa via three land routes and two maritime routes. These networks are connected across a number of economic corridors. The BRI has driven regional initiatives such as the Singapore-Kunming Rail Link, and the East Coast Rail Link, and is acting as a catalyst not just for infrastructure investments, but also for the broader economic growth of the region. We previously discussed these initiatives in the first report of our Infrastructure Series, *Understanding infrastructure opportunities in ASEAN* (2017). More details can be found in the following PwC publications:
- *Preparing the Ancient Silk Routes* (2017)
- *A Strategist's Guide to China's Belt and Road Initiative* (2018)

Alibaba logistics hub[6]
In addition to an extensive transport network, the BRI has also driven a series of Chinese investments in other infrastructure sectors. For instance, Chinese e-commerce conglomerate Alibaba Group has announced plans to establish a regional logistics hub in Malaysia. The hub is to serve as a centralised facility for the region, so as to achieve faster clearance for imports and exports.

[5] Enhancing Infrastructure Development for Thailand's Future Growth, Board of Investment, Thailand
[6] "Alibaba to set up regional logistics hub in Malaysia", Reuters, March 2017

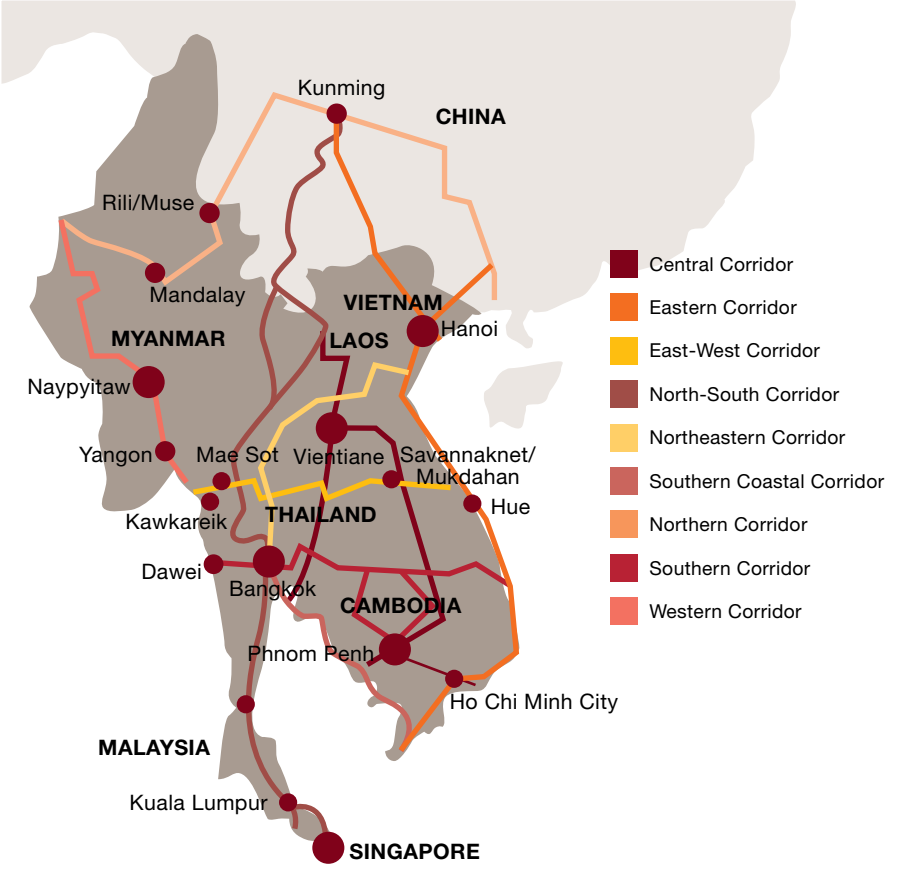
Greater Mekong Subregion

With the idea of increasing connectivity, improving competitiveness and fostering a greater sense of community, the GMS programme was established in 1992 with assistance from ADB. It comprises Cambodia, China (specifically, the Yunnan Province and Guangxi Zhuang Autonomous Region), Lao PDR, Myanmar, Thailand and Vietnam. The programme is anchored on identifying and implementing high-priority sub-regional projects across sectors to improve economic cooperation.

At the fourth GMS summit in 2011, a 10-year Strategic Framework was adopted to guide the GMS from 2012 to 2022. To operationalise the Strategic Framework, a GMS Regional Investment Framework (RIF) was endorsed in December 2013[7]. This sets out a pipeline of priority projects in the GMS. As of the mid-term review of the RIF 2022 in September 2017, there were 222 investment and technical assistance projects requiring financing of approximately US$64 billion[8].

In the transport arena, the initiative intends to develop priority transport corridors that link the sub-region together. The principal transport corridors form the base of the three major GMS economic corridors, namely the North-South Economic Corridor, East-West Economic Corridor and Southern Economic Corridor, as shown in Figure 5. Different infrastructure projects have been identified around these economic corridors for development and implementation.

Figure 5: Transport corridors of the GMS



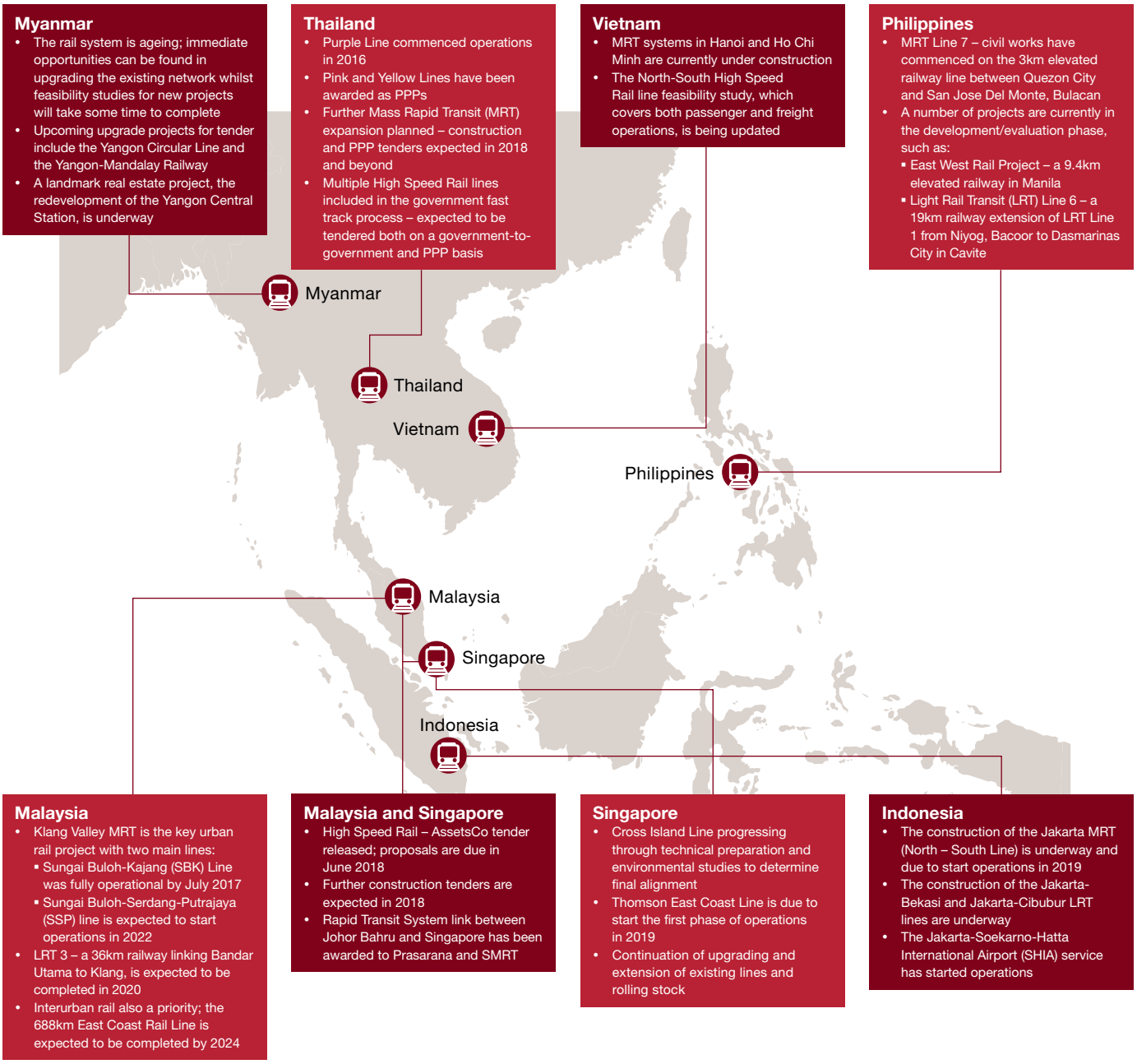
Source: GMS Information Portal

[7] Greater Mekong Subregion Economic Cooperation Program, ADB, 2015
[8] Overview of the RIF 2022, ADB, September 2017

Rail attracts attention

With increasing urbanisation and mobility, ASEAN is seeing an increasing emphasis on rail projects, given their efficiencies vis-à-vis road transport. As seen in Figure 3, the cumulative railway spending between 2016 and 2025 in the Asia Pacific is expected to amount to US$2.3 trillion[9] — the highest of all regions. Specifically, total investments in subway construction in Asia are projected to reach US$230 billion in the next 15 years[10]. Some of these projects have already begun to take shape, as illustrated in Figure 6.

Figure 6: Rail projects planned in the region



Source: PwC analysis

[9] PwC analysis; Oxford Economics
[10] Meeting Asia's Infrastructure Needs, ADB, 2017

Pink Line Monorail, Thailand

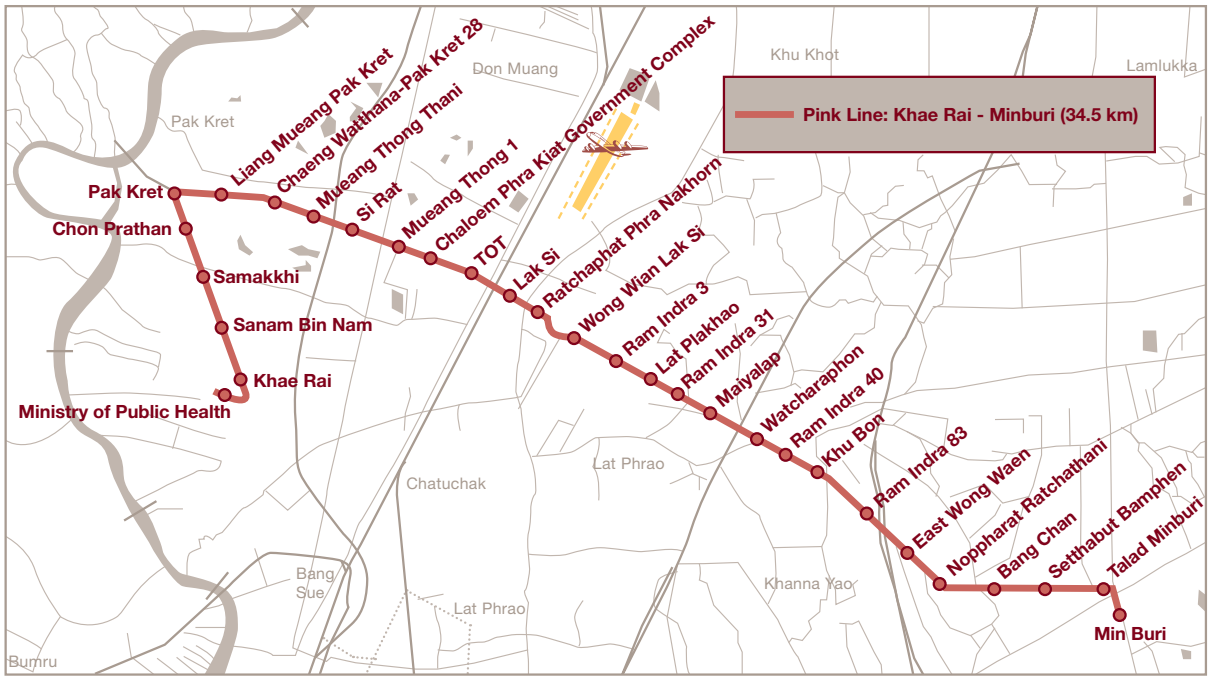
Driver of demand

The United Nations estimates that Thailand's urbanisation rates will jump from 49% in 2014 to 72% by 2050[11]. The increased population density in urban cities will, in turn, drive demand for a more efficient and effective transportation networks. In order to address this, the Thai government has planned a series of transport projects, including the recently awarded Pink Line Monorail in Bangkok.

Project background

The Pink Line is a 34.5km monorail project spanning Khae Rai and Minburi in Bangkok. It will be developed under a PPP net cost concession contract for a period of 33 years and three months. In June 2017, the PPP contract was signed[12]. Operations are expected to commence in 2020, and run for a period of 30 years. The THB56.7 billion (US$1.73 billion) project consists of 30 stations and has a service capacity of 30,000 passengers hourly[13].

Figure 7: Pink Line monorail



Source: The Pink Line, Mass Rapid Transit Authority of Thailand (MRTA)

[11] World Urbanization Prospects: The 2014 Revision, United Nations, 2014
[12] MRTA Pink Line, Bangkok, Railway Technology
[13] The Pink Line, MRTA

Transport projects in the pipeline (non-exhaustive)

Here, we summarise the transport projects, categorised by sub-sector, in the pipeline for ASEAN.

Table 4: Road and bridge projects

No.	Project	Country	Status	Length (km)	Value (US$ million)
	Road and bridge				
1	Phnom Penh-Sihanoukville High-Speed Expressway	Cambodia	Planning	275	536
2	Cileunyi - Bandung - Tasikmalaya Toll Road	Indonesia	Planning	100	3,745
3	Jakarta Integrated Dual Purpose Tunnel Project	Indonesia	Planning	24	2,560
4	Tebing Tinggi - Parapat - Sibolga Toll Road	Indonesia	Planning	200	1,483
5	Vientiane - Pakse (Champassak) Highway	Lao PDR	In tender	585	Unavailable
6	Pan-Borneo Highway - Phase II	Malaysia	Planning	740	Unavailable
7	Yangon-Mandalay Expressway Upgrade Project	Myanmar	Planning	589	Unavailable
8	Manila (Metro Manila) - Bataan (Central Luzon) Coastal Road Project	Philippines	Feasibility studies underway	Unavailable	8,062
9	Laguna Lakeshore Expressway Dike Project	Philippines	Planning	47	2,730
10	North-South Expressway, East Coast Parkway - Admiralty Road West	Singapore	Planning	21.5	Unavailable
11	Kanchanaburi - Ban Phu Nam Ron Motorway	Thailand	Planning	82	1,300
12	Bang Yai (Nonthaburi) - Kanchanaburi Motorway Project	Thailand	Planning	98	610
13	Belt Road 4 Project, Thanh pho Ho Chi Minh (City)	Vietnam	Planning	198	4,458
14	Ha Noi (City) Ring Road No. 5 Project	Vietnam	Planning	331.5	4,015
15	Ha Noi (City) Ring Road No. 4 Project	Vietnam	Planning	136	3,100

Source: BMI

Table 5: Rail projects

No.	Project	Country	Status	Length (km)	Value (US$ million)
	Rail				
1	International Airport - Special Economic Zone Rail Link, Phnom Penh	Cambodia	Feasibility studies underway	Unavailable	Unavailable
2	Jakarta (Special City District) - Surabaya (East Java) High Speed Railway Revitalisation Project	Indonesia	Planning	730	7,600
3	Jakarta MRT System, North-South Line - Phase 2	Indonesia	Planning	14.6	2,840
4	Trans-Asian Railway Line, Kunming (Yunnan, China) - Vientiane (Lao PDR)	Lao PDR	Planning	Unavailable	Unavailable
5	New East Coast Railway, Kuala Lumpur - Tumpat (Kelantan)	Malaysia	Planning	600	12,664
6	Yangon-Mandalay Rail Line Upgrade	Myanmar	Planning	622	2,200
7	Makati-Pasay-Taguig Mass Transit System	Philippines	Feasibility studies underway	20	8,010
8	Kuala Lumpur - Singapore High Speed Railway Line	Malaysia / Singapore	Planning	Unavailable	Unavailable
9	Circle MRT Line Stage VI	Singapore	In tender	4	2,650
10	Bangkok-Pattaya-Rayong High-Speed Railway Line Project	Thailand	Planning	194	45,049
11	Chiang Khong (Chiang Rai) - Ban Phachi (Ayutthaya) High Speed Rail Line	Thailand	Planning	655	10,830
12	Sino-Thai Rail Development Project	Thailand	Planning	873	10,639
13	Thanh pho Ho Chi Minh (City) Metro Line 5	Vietnam	Planning	24	4,470
14	Thanh pho Ho Chi Minh (City) Metro Line 4	Vietnam	Planning	37.6	4,450

Source: BMI

Table 6: Port projects

No.	Project	Country	Status	Capacity (TEU)	Value (US$ million)
	Ports				
1	Sihanoukville Autonomous Port Container Terminal	Cambodia	Planning	600,000	200
2	Patimban Deep-Sea Port Project (Cilamaya)	Indonesia	Planning	7,500,000	3,203
3	Patimban Deep-Sea Port Project (Cilamaya) Phase 1	Indonesia	Planning	3,750,000	2,355
4	Deep-Sea Port, Dawei Maritime Hub	Myanmar	Planning	Unavailable	Unavailable
5	Davao Sasa Port Modernisation	Philippines	Planning	Unavailable	400
6	Hon Khoai Port Development Project	Vietnam	Planning	Unavailable	3,500
7	My Thuy Deep Water Port Project	Vietnam	Planning	Unavailable	1,100

Source: BMI

Table 7: Airport projects

No.	Project	Country	Status	Capacity (million passengers)	Value (US$ million)
	Airports				
1	Siem Reap International Airport - Passenger Terminal	Cambodia	Planning	15	1,000
2	Buleleng New Airport	Indonesia	Planning	Unavailable	2,277
3	Karawang International Airport Project	Indonesia	Planning	70	2,148
4	Hanthawaddy International Airport	Myanmar	Planning	12	1,500
5	Manila Bay International Airport	Philippines	In tender	100	14,000
6	Changi Airport - Terminal V	Singapore	Planning	50	Unavailable
7	Suvarnabhumi Phase II Airport Expansion Project	Thailand	In tender	15	1,413
8	Long Thanh International Airport Project	Vietnam	Planning	100	15,800
9	Long Thanh International Airport Project (Phase 3)	Vietnam	Planning	50	6,600

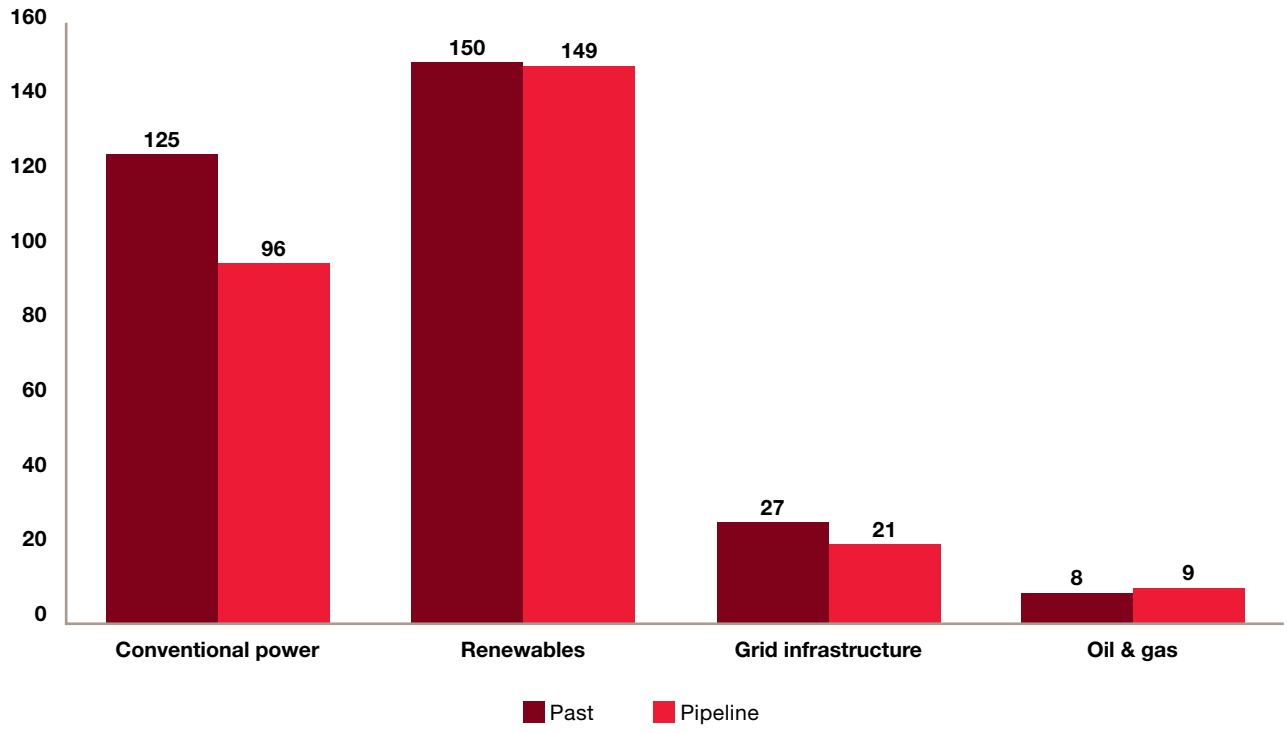
Source: BMI

Energy

The rapid economic and population growth of ASEAN is leading to a huge demand for energy — demand that is estimated to grow at a compound annual growth rate (CAGR) of 4% per year from 2014 to 2025[14].

In other words, the region has to be ready to handle a doubling of electricity demand between 2014 and 2025. Governments are responding accordingly by continuing their focus on power projects with a new focus on renewables (Figure 8).

Figure 8: Energy projects by sub-sector (past vs pipeline)



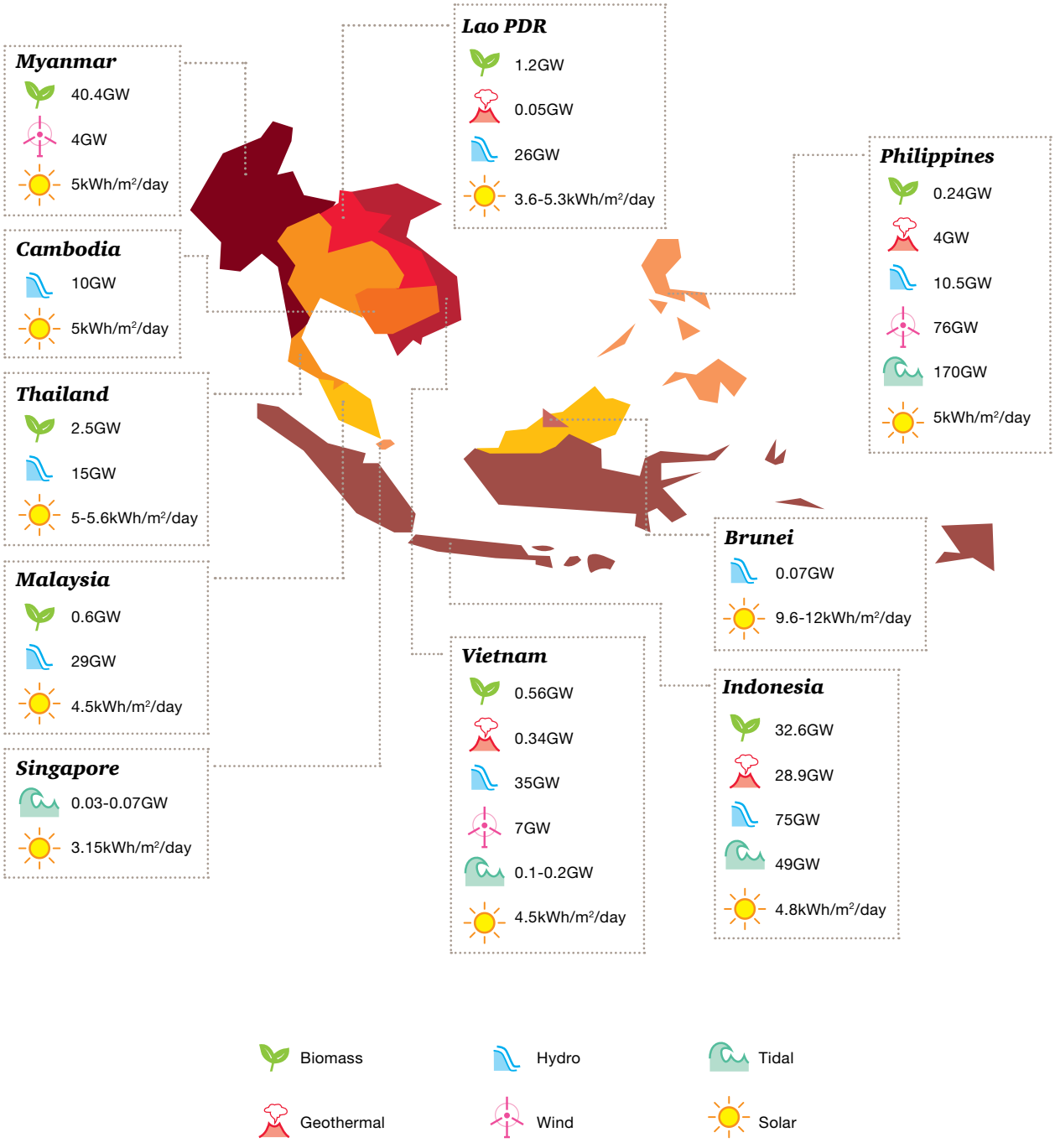
Source: BMI
While it may appear to be a downward trend in the number of projects, it should be noted that the number of years in each period are different.

Focusing on renewables

Climate change and resource scarcity are giving rise to concerns over energy security, which is driving the need for the development of sustainable infrastructure. One sector with high potential for ASEAN governments is renewable power generation, especially since many countries are rich in renewable energy sources. This is visually summarised in Figure 9.

[14] Renewable Energy Outlook for ASEAN, International Renewable Energy Agency (IRENA) and ASEAN Centre for Energy (ACE), 2016

Figure 9: Summary of renewable energy potential in ASEAN



Source: ASEAN Power Cooperation report, ACE and China Renewable Energy Engineering Institute, July 2017

In order to tap into this renewable energy potential and move towards more sustainable forms of energy, ASEAN is aiming for 23% of its total primary energy supply (TPES) to come from renewable energy by 2025 [15].

This target is a significant, and ambitious, increase — in 2014, renewables only contributed to 9.4% of TPES[16]. To achieve this, each ASEAN government has set out their own renewable energy targets (Table 8).

Table 8: Official and unofficial installed renewables capacity targets

Country	Solar (MW)	Wind (MW)	Biomass (MW)	Geothermal (MW)	Others (MW)	Total (MW)	Target (Year)
Cambodia[17]	*	*	*	*	*	100.0(i)	NA
Indonesia[18]	444	640	488(ii)	6,150	-	7,722(iii)	2025
Lao PDR[19]	33	58	58	-	87(iv)	636	2025
Malaysia[20]	854	0	1,340	-	800	2,994	2030
Philippines[21,(v)]	285	2,378	316	3,461	71(vi)	6,510	2030
Singapore[22]	350	*	*	*	*	350	2020
Thailand[23]	6,000	3,002	5,570	-	1,780(vii)	16,352	2036
Vietnam[24]	*	*	*	*	*	27,195(viii)	2030

Notes

* Not publicly disclosed or broken down by sub-sector
- No targets set
(i) This is an unofficial target as the government has not released any plans to achieve it
(ii) Includes biogas as well
(iii) Does not include the target for large-scale hydropower (13,100MW)
(iv) Biogas and solid waste
(v) Philippines' targets are set to be revised by the government and this is expected to be released soon. These targets do not include targets for hydropower.
(vi) Ocean energy
(vii) Includes waste-to-energy (500MW), biogas (600MW) and energy crops (680MW)
(viii) Target installed capacity by 2030

[15] "Development of Renewable Energy Outlook for ASEAN – a REmap 2030 analysis", ACE
[16] Renewable Energy Outlook for ASEAN, IRENA and ACE, 2016
[17] Mekong Strategic – Switching On; Cambodia's Path to Sustainable Energy Security
[18] Indonesia's Electricity Supply Business Plan 2016-2025 (RUPTL), USAID
[19] ADB
[20] Malaysia's National Renewable Energy Policy and Action Plan
[21] Philippines' Department of Energy – National Renewable Energy Program
[22] Singapore Energy Market Authority
[23] Thailand's Alternative Energy Development Plan
[24] Vietnam's Power Development Plan

In addition to renewable capacity addition targets, the governments in the region have also implemented various policies and regulations to stimulate the development of renewable energy. A snapshot of key policies and regulations in the region are captured in Figure 10.

Figure 10: Key renewable energy policies and regulations in ASEAN

Notes

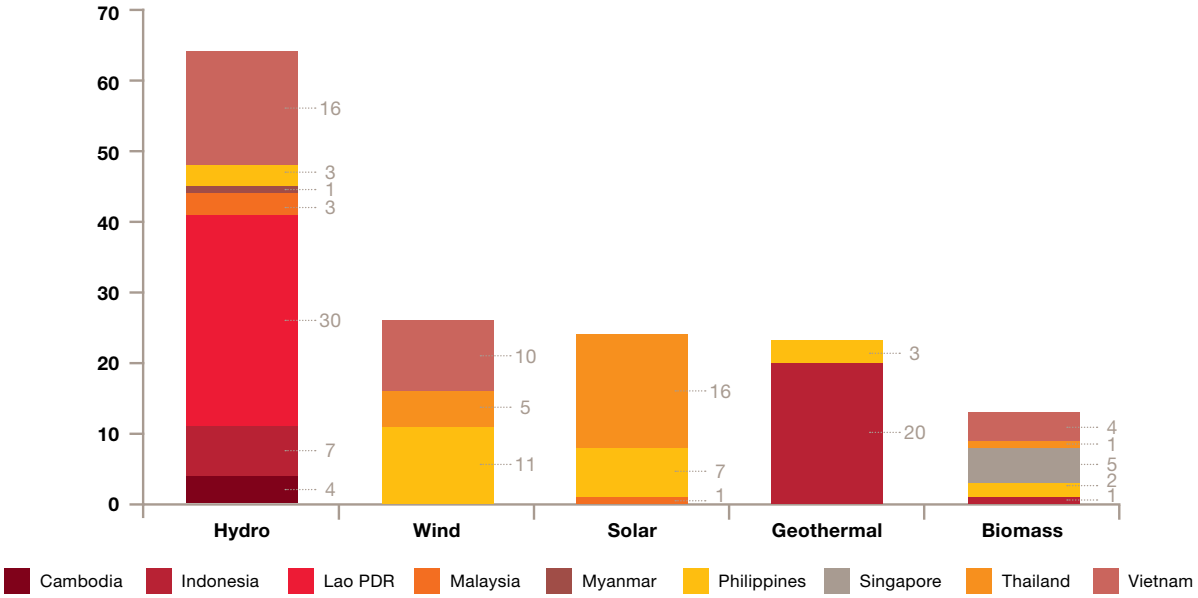
(i) Hybrid – a combination of two or more renewable energy types/sources
(ii) Electricity Generating Authority of Thailand (EGAT)
(iii) Other ASEAN members such as Lao PDR, Cambodia and Myanmar do not have any formal programmes or policies promoting renewable energy development

Source: ASEAN Power Cooperation report, ACE and China Renewable Energy Engineering Institute, July 2017

In the past, the bulk of the renewable energy generated in ASEAN has come from hydropower projects (Figure 11). These were mainly found in Lao PDR and Vietnam.

Geothermal and wind come next, in terms of number of projects, where most of the developments were found in Indonesia, Philippines, Thailand and Vietnam.

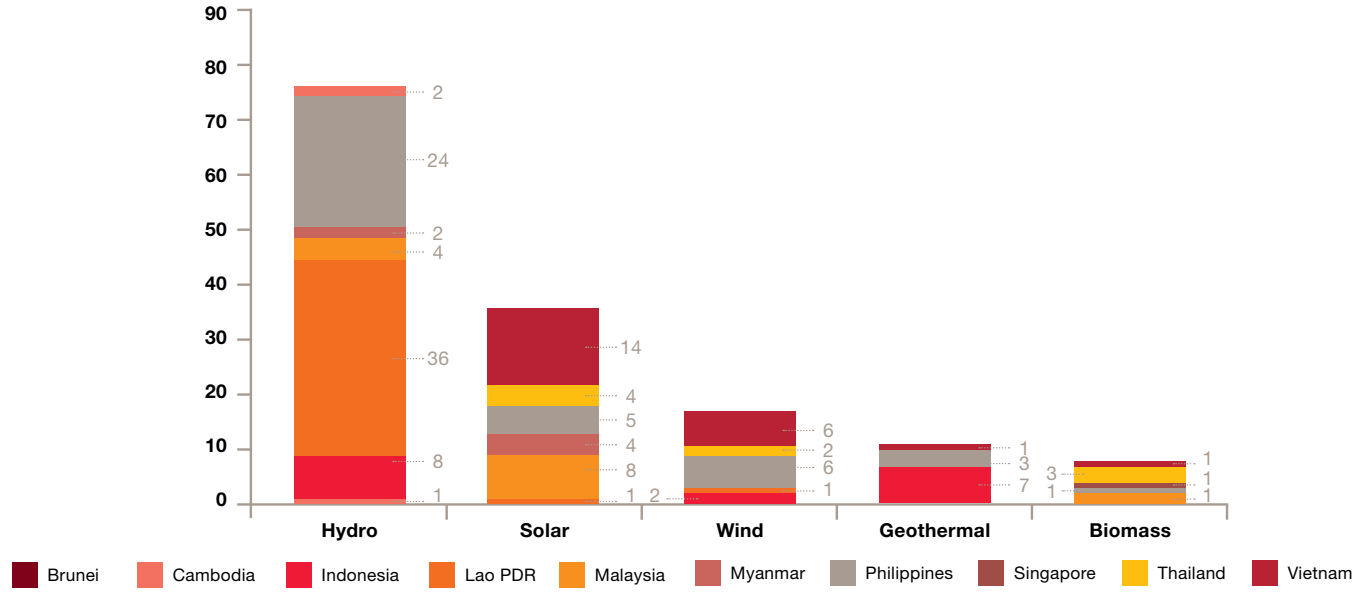
Figure 11: Past renewable energy projects by sub-sector



Source: BMI

However, in the future and as illustrated in each country's renewable energy targets, we expect an increasing emphasis on solar, wind and biomass power projects. Hydro still leads in the region, but it is worthwhile noting that this sub-sector is primarily led by Lao PDR (Figure 12). The country intends to leverage its hydro potential to transform itself into the "battery of Asia" and export electricity to neighbouring energy-deficit countries.

Figure 12: Pipeline of renewable energy projects by sub-sector



Source: BMI

Solar

One interesting change in ASEAN is the dramatic increase in solar projects — from 7% of completed projects to 24% in the pipeline. This is mainly due to huge reductions in the costs of solar projects, along with improved efficiencies in solar energy generation. Solar has seen a drastic decrease in the levelised cost of electricity (LCOE) of renewable energy sources, and is expected to drop another 66% by 2040[25]. One critical factor in the downward trend of costs is the reduction in capital expenditure (capex).

In 2016 alone, average capex per MW for solar fell by 13%[26]. Further, the average efficiency for solar photovoltaic cells increased from 17.5% to 19.8%, between 2010 and 2015[27]. These improved efficiencies in solar energy generation have played a significant role in reducing the cost of solar energy generation.

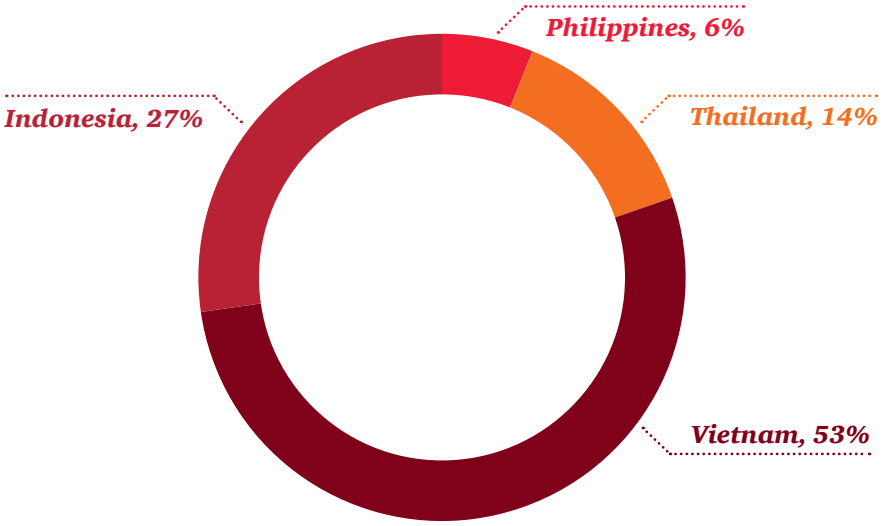
Wind

Wind projects have been seen predominantly in the Philippines and Vietnam, as these countries have the highest wind potential in the region (Figure 9). This is expected to extend into the pipeline as these countries continue to tap on their wind potential. In 2025, the estimated contribution mix of installed wind energy generation capacity (by GW) in ASEAN is shown in Figure 13.

Hydro

To meet the regional targets for renewable energy, we earlier mentioned that individual ASEAN countries have set national targets in the renewables sector. For example, the 8th Five-Year National Socio-Economic Development Plan 2016-2020 of Lao PDR states that the government has signed 369 hydro project contracts which are at various stages of development as at 2016 [28].This is an indication of the focus on hydro in Lao PDR, which continues to be the main contributor to the number of hydro projects in the past and in the pipeline.

Figure 13: Estimated installed wind energy generation capacity in ASEAN (2025)



Source: Renewable Energy Outlook for ASEAN, IRENA and ACE, 2016
These estimates are based on current or planned policies, as well as expected developments in the market. There is no estimated installed wind energy generation capacity for the remaining ASEAN countries.

[25] New Energy Outlook 2017, Bloomberg New Energy Finance, 2017
[26] Global trends in renewable energy investment 2017, UN Environment Programme and Bloomberg New Energy Finance, 2017
[27] Ibid
[28] 8th Five-Year National Socio-Economic Development Plan (2016-2020), Ministry of Planning and Investment, June 2016

Energy projects in the pipeline (non-exhaustive)

Here, we summarise the energy projects, categorised by sub-sector, in the pipeline for ASEAN.

Table 9: Conventional energy projects

No.	Project	Country	Status	Capacity (MW)	Value (US$ million)
	Coal				
1	Nam Dinh power complex	Vietnam	Planning	2,400	4,500
2	Long An No. 2 thermal power plant	Vietnam	Planning	1,600	3,170
3	Song Hau 2 coal-fired power plant	Vietnam	Planning	2,000	3,500
4	Vung Ang III thermal power plant	Vietnam	Planning	2,400	2,500
5	Adaro Energy coal-fired power plant	Indonesia	Planning	1,200	3,500
6	Bojonegara coal-fired project	Indonesia	Planning	2,000	2,000
7	Peranap coal-fired power plant	Indonesia	Planning	1,200	1,600
8	Sumsel 9 coal-fired power plant	Indonesia	In tender	1,200	1,560
9	Calaca coal-fired power plant expansion	Philippines	Planning	1,000	1,600
10	Calaca coal-fired power plant expansion – Phase II and III	Philippines	Planning	700	1,400
11	Subic coal-fired power plant expansion	Philippines	Planning	600	1,200
12	Thepa coal-fired power plant	Thailand	Approved by Cabinet	2,000	Unavailable
13	Mae Moh coal-fired power plant (replacement units 8 and 9)	Thailand	Approved by Cabinet	450	Unavailable
14	Balingian II coal-fired power plant	Malaysia	Project announced	300	Unavailable
15	Yangon coal-fired power plant	Myanmar	Planning	600	Unavailable
	Gas				
1	Gulf Energy natural gas power plant, Hemaraj Industrial Estate	Thailand	Approved by Cabinet	2,500	1,668
2	Gulf Energy natural gas power plant, Rojana Industrial Park	Thailand	Approved by Cabinet	2,500	1,662
3	Bang Pakong combined-cycle power plant (replacement)	Thailand	Approved by Cabinet	1,300	Unavailable
4	Tadmax combined-cycle power plant	Malaysia	Planning	1,200	810

5	Kedah combined-cycle power plant	Malaysia	Planning	1,000	Unavailable
6	Java 1 combined-cycle power plant	Indonesia	Planning	1,760	1,800
7	Grati combined-cycle power plant extension	Indonesia	Planning	501	260
8	Gas power plant Muara Karang expansion	Indonesia	Planning	500	288
9	Dung Quat Economic Zone power plant	Vietnam	Planning	1,500	Unavailable
10	O Mon IV combined-cycle power station	Vietnam	Planning	750	793
11	Gas-based power plant	Philippines	Planning	480	Unavailable
12	Tabangao LNG power plant	Philippines	Feasibility studies underway	415	Unavailable
13	Thanlyin gas-fired power generation facility	Myanmar	Planning	400	1,000

Source: BMI

Table 10: Renewable energy projects

No.	Project	Country	Status	Capacity (MW)	Value (US$ million)
	Hydro				
1	Sambor Dam Project	Cambodia	Planning	1,800	Unavailable
2	Kayan River Hydropower Project	Indonesia	Planning	6,600	17,800
3	Upper Cisokan Hydropower Project	Indonesia	Planning	1,040	800
4	Pha Mong Hydropower Project	Lao PDR	Planning	2,670	Unavailable
5	Ban Khoum Hydropower Project	Lao PDR	Feasibility studies underway	2,330	Not available
6	Laung Prabang Hydropower Project	Lao PDR	Planning	1,410	1,700
7	Pak Lay Hydropower Project	Lao PDR	Feasibility studies underway	1,320	1,700
8	Baleh Dam	Malaysia	Planning	1,285	454
9	Kunlong Hydropower Plant	Myanmar	Planning	1,400	Unavailable
10	Apayao-Abulog Hydroelectric Power Project	Philippines	Planning	600	1,500
11	Rodriguez Wawa Project	Philippines	Planning	500	873
12	Alimit Hydropower Complex	Philippines	Planning	390	Unavailable
13	Diduyon Hydropower Plant	Philippines	Planning	320	610
14	Hoa Binh Hydropower Plant Expansion	Vietnam	Planning	540	Unavailable
	Solar				
1	National Solar Park	Cambodia	Feasibility studies underway	100	Unavailable
2	Vientiane Solar Power Plant	Lao PDR	Feasibility studies underway	60	Unavailable
3	Metronic Solar Project	Malaysia	Planning	250	Unavailable
4	Sepang Solar PV Plant	Malaysia	Planning	50	Unavailable
5	Ayeyarwady Solar Project	Myanmar	Planning	300	1,000

6	Minbu Solar Power Plant	Myanmar	Planning	220	275
7	Macabud Solar Power Project	Philippines	Planning	30	133
8	Matong Solar Power Project	Thailand	Approved by Board of Investment	Unavailable	250
9	Ha Tinh Province Solar Power Plant	Vietnam	Planning	300	650
10	Hanwha PV Project	Vietnam	Planning	200	200
	Wind				
1	Jeneponto 1 Wind Farm	Indonesia	Planning	62.5	135
2	Iloilo 2 Wind Project	Philippines	Planning	500	1,270
3	Phu Cuong Offshore Wind Farm	Vietnam	Feasibility studies underway	800	2,000
	Geothermal				
1	Baturaden Geothermal Power Plant	Indonesia	Planning	220	880
2	Dieng Geothermal Power Plant Expansion	Indonesia	Planning	110	300
3	Kalinga Geothermal Power Plant	Philippines	Planning	100	300
4	Biliran Geothermal Plant	Philippines	Planning	49	Unavailable
5	Dakrong District Geothermal Power Plant	Vietnam	Planning	25	46
	Biomass				
1	Suphanburi biomass power plant	Thailand	Approved by Board of Investment	Unavailable	49
2	Taman Beringin waste-to-energy incinerator project	Malaysia	In tender	15	247
3	Mekong Delta waste-to-energy plant	Vietnam	Planning	Unavailable	Unavailable
4	Integrated biomass-solar power generation plant	Singapore	Planning	Unavailable	Unavailable
5	Rice husk fired power plant	Philippines	Planning	24	45

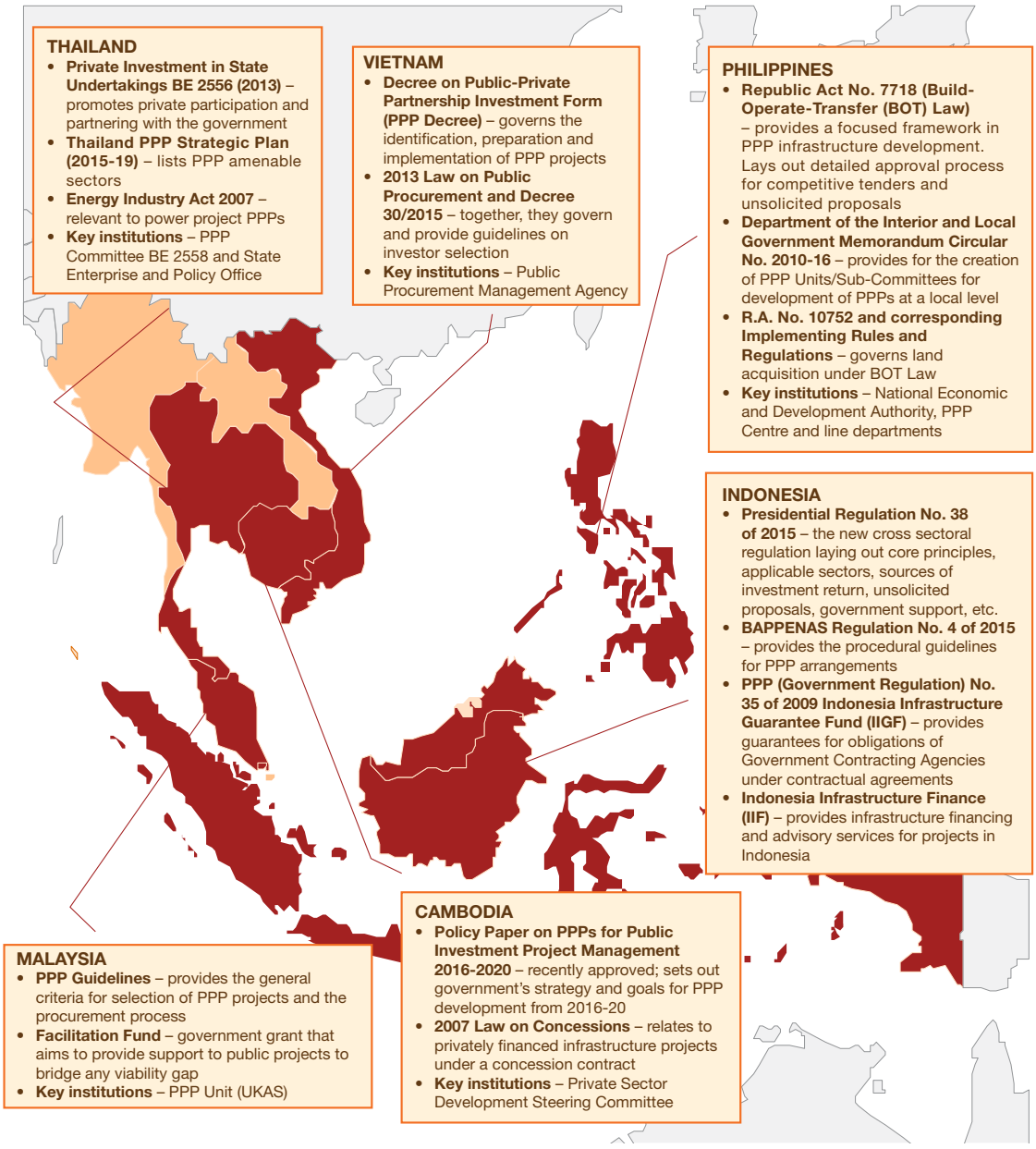
Source: BMI

Chapter 3: Public Private Partnerships

With a significant pipeline of infrastructure projects to implement, many ASEAN governments intend to leverage PPPs to complement their fiscal resources as well as leverage private sector expertise and efficiencies. To promote PPPs, the ASEAN Secretariat and the Organisation for Economic Cooperation and Development (OECD) have developed the principles for PPP framework as a guidance for member countries (we discussed this in detail in our first report, *Understanding infrastructure opportunities in ASEAN* (2017)).

With this, a number of the ASEAN countries already have an established PPP ecosystem (Figure 14) and more are expected to do so soon.

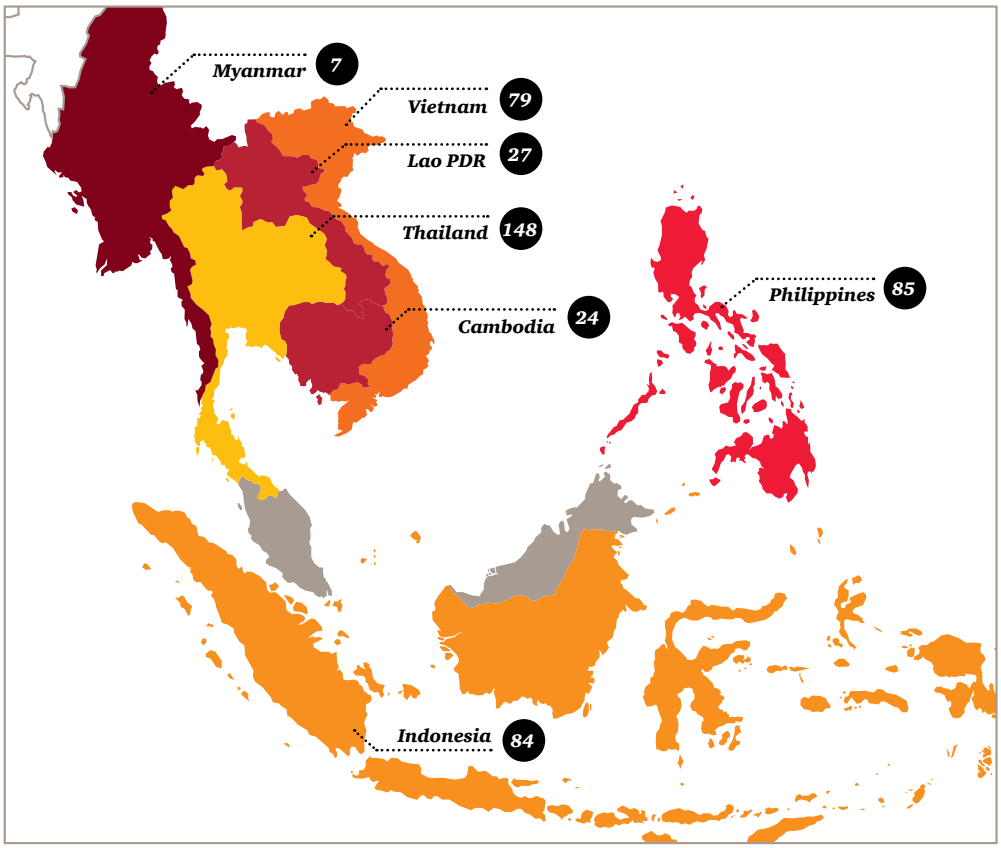
Figure 14: PPP framework in ASEAN countries



Source: PwC analysis

In fact, a number of ASEAN countries already have experience in executing PPP projects (Figure 15).

Figure 15: Number of active PPP projects in the region



Source: PPP Knowledge Lab; data for Malaysia, Singapore and Brunei is not available

An active PPP project is a project that is about to start construction, already under construction or operational. Countries with the most number of active PPP projects in the region are Thailand, Indonesia, Philippines and Vietnam. These countries look favourably on PPPs to boost infrastructure development. In fact, as mentioned in our first report, Philippines is actively exploring a hybrid PPP model where the initial upfront construction will be delivered through a government-to-government arrangement, while the operations and maintenance of the project will be managed by the private sector through a PPP contract. This is a deviation from the Philippines' previous PPP models under the Aquino administration. It should be noted that the Duterte administration is actively procuring government-to-government type investments from China, Japan, and others, as an alternative to the use of private sector capital.

Meanwhile, the ASEAN countries with the least PPP experience are Brunei, Cambodia, Lao PDR and Myanmar. That said, these countries are looking at leveraging PPPs to develop infrastructure. In particular, Lao PDR is currently establishing a PPP framework to promote PPPs and Cambodia, with support from ADB, is currently preparing a 100MW solar PV project for development under a PPP arrangement.

For an objective take on the different frameworks, we referenced the World Bank's 2017 PPP Procurement Benchmark, which scores the PPP frameworks of the different ASEAN countries (Table 11).

A number of the countries in the region rank above the average scores of upper-middle income countries. Specifically, the scores of Philippines, Vietnam, Indonesia, Singapore and Thailand indicate an established PPP environment that offers sustainable private sector opportunities. Of course, it is also important to recognise that there is scope for improvement and these countries are actively working towards improving their PPP programmes.

Table 11: PPP benchmarking scores of ASEAN countries

Country	PPP Preparation (Score)	PPP Procurement (Score)	Unsolicited Proposals (Score)	PPP Contract Management (Score)
Cambodia	8	20	NA	69
Indonesia	50	70	58	61
Malaysia	46	43	NA	24
Myanmar	2	40	NA	25
Philippines	96	85	67	84
Singapore	58	75	NA	64
Thailand	54	63	NA	57
Vietnam	75	85	42	58

Source: Benchmarking PPP Procurement 2017, World Bank and Public-Private Infrastructure Advisory Facility (PPIAF), 2017; data for Brunei and Lao PDR is not available
Countries are scored between 1 and 100, with 100 being the highest score.

Notes

PPP Preparation - This covers the period and activities that precede and inform the decision to launch a PPP procurement process. It explores whether the identification of a potential PPP project happens within the broader context of public investments and thereby its consistency with government priorities. It also examines which assessments are required or conducted to define key features of the PPP project and its feasibility. In addition, it considers other activities that lead to the procurement of the PPP project (that is, activities undertaken before publishing the public tender notice, such as preparing the draft contract or obtaining land and permits).

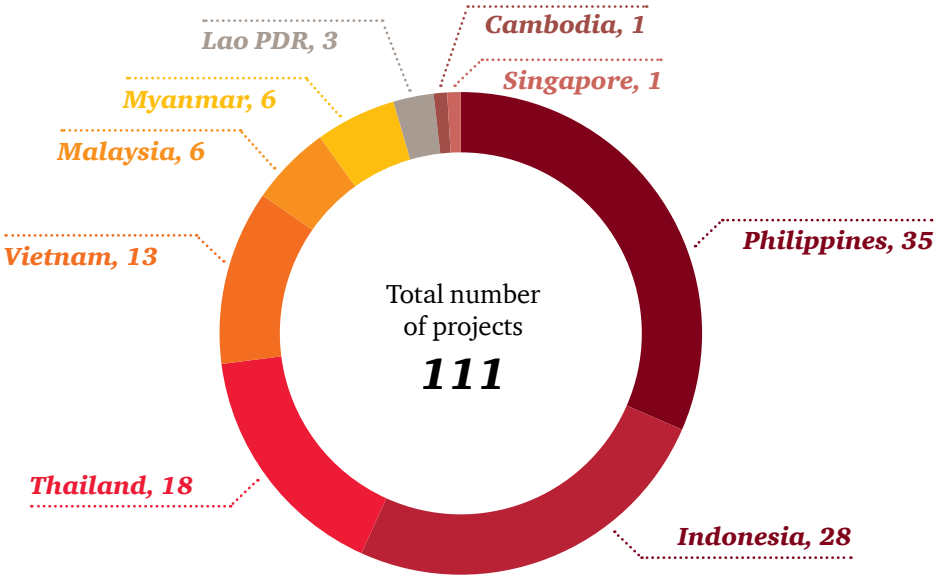
PPP Procurement - This section focuses on the process for selecting a private partner to undertake the responsibility of developing the PPP project. The range of topics in this section reflects recognised good practices in selecting private partners and examines whether different regulatory frameworks adhere to them. The transparency and fairness of the process, evaluation criteria for bids, and specific provisions regarding lack of competition are major themes in this section.

Unsolicited Proposals for PPPs - This first defines whether the regulatory framework allows for the submission of unsolicited proposals (USPs). When applicable, it examines whether a specific procedure is in place to evaluate their feasibility and their consistency with other government priorities. In addition, it assesses whether a competitive procedure is required to select the private partner. It also explores what compensation mechanisms are in place for USPs.

PPP Contract Management - This considers the existence of a well-established and comprehensive contract management framework to facilitate smooth implementation of a PPP project. It assesses the monitoring and evaluation systems for PPPs, as well as the regulatory provisions regarding PPP contract modification and renegotiation, dispute resolution, lender step-in rights, and termination.

The InfraPPP World database of PPP projects lists a total of 111 PPP projects in the pipeline for ASEAN. This refers to projects in the planning or tender stages. Philippines has the largest number of PPP projects in the pipeline followed by Indonesia, Thailand and Vietnam (Figure 16). In general, we observe that countries that have a defined process for selection of PPPs have a healthy pipeline.

Figure 16: Number of PPP projects in the pipeline by country

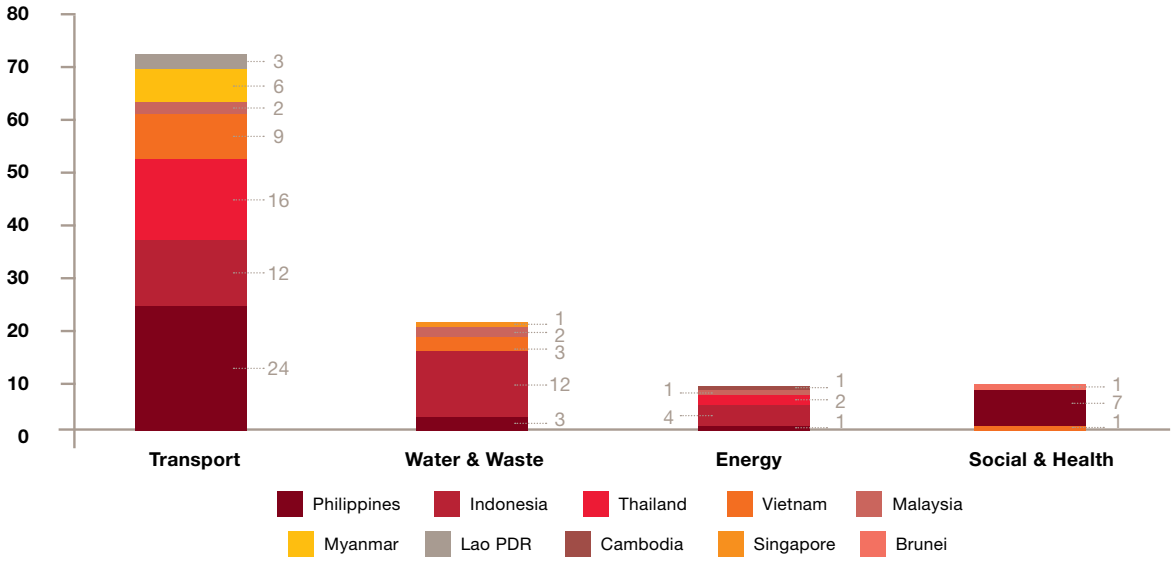


Source: InfraPPP World
The number of PPPs for the Philippines includes hybrid PPPs, which encompass government-to-government arrangements.

Among the sectors, transport PPPs constitute more than 60% of the PPP pipeline projects. They are well distributed across the region with Philippines having the most number of transport PPPs, followed by Thailand and Indonesia.

Water and waste treatment is another active sector with the majority of PPPs taking place in Indonesia. These are detailed in Figure 17.

Figure 17: PPP project pipeline by sector



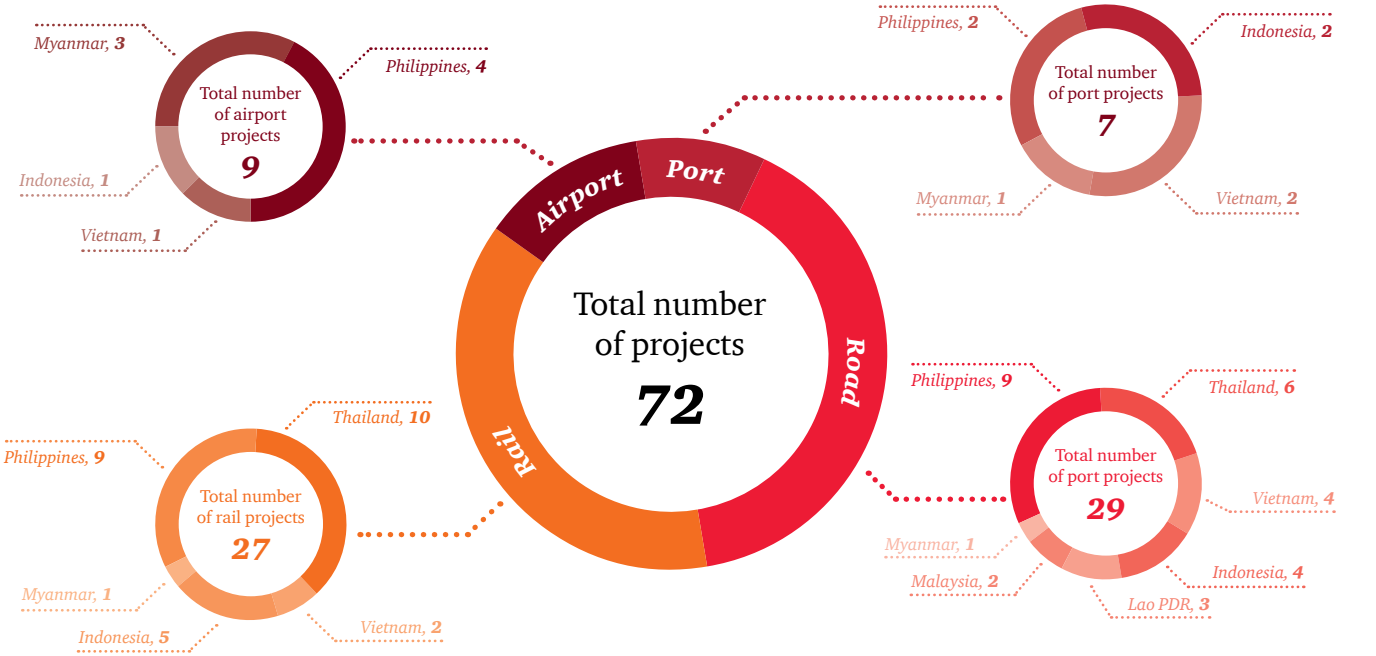
Source: InfraPPP World

Transport: Road and rail take a large slice of the pie

The impact of trade competitiveness, urbanisation and the need for improved mobility can once again be observed with transport projects comprising a significant portion of the PPP projects pipeline. Road and rail projects contribute almost equally. Collectively, they constitute more than 75% of the pipeline of transport PPP projects (Figure 18).

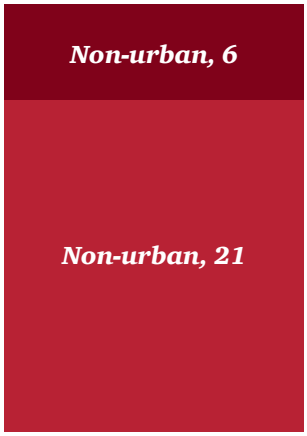
Highlighting the impact of urbanisation and improved mobility, approximately 80% of the rail projects are urban focused (Figure 19), including MRT, LRT, monorail, tramline, central rail station, and more. Thailand and the Philippines have an ambitious urban rail pipeline while Indonesia and Vietnam are contributing fewer projects.

Figure 18: Transport PPP projects by sub-sector



Source: InfraPPP World

Figure 19: Rail PPP projects classified into urban and non-urban



Source: InfraPPP World

Transport PPP projects in the pipeline (non-exhaustive)

Table 12: Development status of transport PPP projects in ASEAN

No.	Project	Country	Status	Value (US$ million)
	Road			
1	Trans-Sumatra Toll Road: Kayu Agung – Betung	Indonesia	Project in planning	1,100
2	Manado - Bitung toll road	Indonesia	Project in planning	330
3	Laos Road No. 3: ASEAN Highway No. 3 PPP	Lao PDR	Project in planning	Unavailable
4	Setiawangsa-Pantai Expressway SPE (Duta-Ulu Kelang Expressway Phase 3)	Malaysia	Project in planning	1,253.01
5	Cebu BRT PPP project	Philippines	Project in planning	Unavailable
6	North Luzon Expressway (NLEX) - Cavitex Port Expressway Link	Philippines	Unsolicited proposal	1,274.87
7	Nakhon Pathom and Cha-am motorway PPP project	Thailand	Project in planning	2,300
8	Chiang Khong district intermodal facility PPP project	Thailand	Project in planning	Unavailable
	Rail			
1	Second line of Jakarta's MRT	Indonesia	Project in planning	Unavailable
2	LRT Line 2 Operations and Maintenance PPP project	Philippines	Project in tender	219
3	Mindanao Railway PPP project	Philippines	Project in planning	Unavailable
4	LRT Line 6 PPP project	Philippines	Project in tender	1,404.21
5	Development of Bangkok's MRT Orange Line (east section) elevated train PPP project	Thailand	Project in planning	3,100
6	Bangkok-Rayong speed rail PPP project	Thailand	Project in planning	4,300
7	Bangkok's MRT Purple Line PPP project	Thailand	Project in planning	3,700
8	Ho Chi Minh City monorail PPP	Vietnam	Project in planning	336
	Airport			
1	Kertajati Airport project	Indonesia	Project in tender	1,800
2	Kawthaung Airport PPP Project	Myanmar	Project in tender	Unavailable
3	Clark International Airport Operations and Maintenance Project	Philippines	Unsolicited proposal	248.74
4	Long Thanh Airport PPP project	Vietnam	Project in planning	15,800
	Port			
1	Phase I - Sections II & III of the Makassar New Port	Indonesia	Project in planning	325
2	Myanmar Industrial Port (MIP) renovation project	Myanmar	Project in planning	200
3	San Ramon Newport PPP project at the Zamboanga City Special Economic Zone	Philippines	Project in planning	Unavailable
4	Hon Khai island deepwater port PPP project	Vietnam	Project in planning	2,500.00

Source: InfraPPP World

Energy: Procured under non-PPP frameworks

Despite a large pipeline of energy projects in the region, it is interesting that this does not translate into a large pipeline of energy PPPs. We are of the view that this is generally because energy projects in the region are developed and implemented under alternative frameworks to the mainstream PPP programmes.

For example, in Thailand, PPPs fall under the remit of the Private Investment in State Undertakings (PISU) Act but energy projects are procured separately under sector specific policies and frameworks.

In fact, the pipeline of energy PPPs as provided in the InfraPPP World database is primarily dominated by waste-to-energy projects in Indonesia and Thailand (Table 13). Within power generation, the other PPP projects in the pipeline are limited to two solar PV projects in Cambodia. The other projects are related to the oil and gas sectors.

In addition, we note that independent power projects are theoretically PPPs by definition, and have earlier listed some energy projects in the pipeline in Table 9 (page 26) and Table 10 (page 28).

Energy PPP projects in the pipeline (non-exhaustive)

Table 13: Development status of energy PPP projects in ASEAN

No.	Project	Country	Status	Value (US$ million)
	Waste-to-energy			
1	17MW Tangerang waste-to-energy PPP project	Indonesia	Project in tender	Unavailable
2	Taman Beringin waste-to-energy incinerator PFI project	Malaysia	Project in planning	313
3	Nakhon Ratchasima waste-to-energy PPP project	Thailand	Project in planning	62
4	Nonthaburi waste-to-energy PPP project	Thailand	Project in planning	114
	Solar			
1	100MW National Solar Park project	Cambodia	Project in planning	Unavailable

Source: InfraPPP World; PwC analysis

Water and waste: Driven by urbanisation

Rapid urbanisation in the region is driving the need for increased water supply to meet the basic needs of a growing urban populace. It is also leading to an increased need for solid and liquid waste management and treatment. Indonesia has a large pipeline of drinking water treatment and supply projects across the country. Philippines and Vietnam follow with a pipeline that includes water supply and waste water treatment projects. The InfraPPP World database lists solid waste management projects in Indonesia and Malaysia as well. Some of these projects are captured in Table 14.

Water and waste PPP projects in the pipeline (non-exhaustive)

Table 14: Development status of water and waste PPP projects in ASEAN

No.	Project	Country	Status	Value (US$ million)
	Water treatment and supply			
1	Jatiluhur II drinking water PPP project	Indonesia	Project in tender	144
2	Banten drinking water PPP project	Indonesia	Project in tender	72
3	Desalination plant in Forest City (Johor) on PPP	Malaysia	Project in planning	Unavailable
4	Tacloban city north bulk water supply project	Philippines	Project in planning	Unavailable
5	Singapore's fifth desalination plant	Singapore	Project in tender	Unavailable
6	West Saigon wastewater treatment plant	Vietnam	Unsolicited proposal	80
	Solid waste management			
1	Bandung solid waste management improvement in West Java	Indonesia	Project in tender	65

Source: InfraPPP World

Chapter 4: What's next?

The drivers influencing the pipeline of infrastructure projects in ASEAN are rapid economic growth and urbanisation; increasing need for efficient mobility; trade competitiveness; climate change and sustainability; and geopolitics. The influence of these drivers, or a combination of them, has resulted in various initiatives such as:

- Ambitious infrastructure strategic plans and targets announced by governments in ASEAN;
- regional and cross-regional initiatives that aim to integrate and improve connectivity within the region while influencing the geopolitical environment; and
- the push for clean energy by establishing an enabling policy environment and setting aggressive clean energy capacity targets.

This has translated into a strong pipeline of infrastructure projects, particularly in the transport and energy sectors. In transport, we see a continuing shift to rail-based transport over roads given the former's advantages in transporting people more efficiently in terms of travel time, land take and pollution. In energy, there is clear and significant shift to all forms of renewable energy in a bid to address current and future power generation gaps in the region.

To achieve their ambitious infrastructure investment targets, governments in the region are actively looking to leverage PPPs to mobilise private capital and expertise. Most of the countries in the region have, or intend to, establish a strong PPP ecosystem and this has translated into a long pipeline of PPP projects. We would, however, like to highlight that not all of the projects in the pipeline are 'investor ready' and can be brought to the market in the short term. In ASEAN, there has historically been a tendency for governments to bring projects to the market too early before proper preparation has been done. While this is understandable, given the developer and investor appetite for more projects and the availability of financing, in the long run, it actually slows down the project procurement timeline and governments risk losing credibility in the marketplace.

That said, to overcome these issues, we hope that ASEAN countries will adopt best practices in infrastructure planning and PPP project preparation processes as explained in our first report of this Infrastructure Series, *Understanding infrastructure opportunities in ASEAN* (2017). A robust planning and preparation process will ensure that the pipeline of projects is bankable. This will go a long way in building confidence with potential investors, and, when coupled with a strong policy environment, will help in attracting infrastructure investments.

Our third and final report, scheduled for release later in 2018, will cover the financing aspects of infrastructure projects, including developments in the investment landscape and alternative financing sources. Please look forward to it.

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