

A VISION FOR SHARED INFRASTRUCTURE IN THE ASEAN REGION THROUGH PUBLIC PRIVATE PARTNERSHIPS

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ABSTRACT: This is a discussion paper with an objective to initiate dialogue for examining the prospects of the ASEAN members to develop common infrastructure in the public private partnership (PPP) mode and share it across their national boundaries. In the first stage this paper covers the stand and policy framework of the ASEAN member nations for infrastructure project procurement through the PPP mode. In the second stage dimensions for building a conceptual model are proposed based upon the Analytic Hierarchy Process (AHP). The constructs are developed as per the B-O-C-R (Benefits-Opportunities-Costs-Risks) analysis of the member nations. It is hoped that the constructs developed will pave the way for further research in model building for testing the strength of the proposal for mutually cooperative policy formulation at a later stage. This vision of a new paradigm, if made a reality, is expected to create synergistic interdependency of the ASEAN nations. An earlier version of this paper was presented at the Fifth International Conference on Advancement of Development Administration 2016 – Social Sciences and Interdisciplinary Studies (The 5th ICADA 2016 – SSIS) “ASEAN and Globalization: New Paradigm, Interdependency, Democracy, and Accountability (N.I.D.A)” organised by National Institute of Development Administration (NIDA), Bangkok, Thailand during May 26 – 28, 2016. Based on the suggestions and comments received the paper has been revised, expanded and upgraded.

KEYWORDS: ASEAN Cooperation, Cross-Border Infrastructure Development, Interdependency, Public Private Partnerships.

I. INTRODUCTION

The Association of Southeast Asian Nations (ASEAN) which came into being with the signing of the Bangkok declaration in the year 1967 has a current membership of ten nations pursuing a common objective to accelerate their economic growth, social progress and socio-culture evolution while protecting regional stability and resolving their differences peacefully. The ASEAN member nations are Indonesia, Malaysia, Philippines, Singapore, Thailand, Brunei, Cambodia, Laos, Myanmar, and Vietnam.

Today, ASEAN already represents a major economic bloc in Asia — with a total land area of more than 4,300 square kilometres and home to about 620 million people (nearly 9% of the world total). Its GDP is above \$2.3 trillion or about 3.3% of the global total. Its average per capita income (at market prices) was close to \$3,800, or about one-third the global average. Despite the trend toward closer integration, ASEAN’s diversity continues as one of its distinctive characteristics. Regional averages mask huge differences across and within members — both in the stage of development and quality of life.

In the year 2015, ASEAN integration received a major fillip with the formation of the ASEAN Economic Community (AEC). This creates opportunities in the form of a huge market of US \$ 2.6 trillion and over 622 million people. Collectively AEC is the third largest economy in Asia and the seventh largest in the world. The AEC Blueprint 2025 consists of five interrelated and mutually reinforcing characteristics, namely: (i) A Highly Integrated and Cohesive Economy; (ii) A Competitive, Innovative, and Dynamic ASEAN; (iii) Enhanced Connectivity and Sectoral Cooperation; (iv) A Resilient, Inclusive, People-Oriented, and People-Centred ASEAN; and (v) A Global ASEAN.

II. PUBLIC PRIVATE PARTNERSHIPS (PPPs)

ASEAN Economic Community (AEC) has an agenda to pursue partnership arrangements with the private sector, industry associations and the wider community at the regional and national levels and it can be stated that the AEC Blueprint 2025 has thus set the stage for the public private partnerships to be fostered.

PPP Definition

The World Bank PPP Knowledge Lab while defining PPPs states that there is no single, internationally accepted definition of *Public-Private Partnership*. Yet its *Reference Guide* defines it as:

A long-term contract between a private party and a government entity, for providing a public asset or service, in which the private party bears significant risk and management responsibility and remuneration is linked to performance.

This definition:

- Encompasses PPPs that provide for both new and existing assets and related services;
- Includes PPPs in which the private party is paid entirely by service users, and those in which a government agency makes some or all payments;
- Encompasses contracts in many sectors and for many services, provided there is a public interest in the provision of these services and the project involves long-life assets linked to the long term nature of the PPP contract.

The project functions transferred to the private party—such as design, construction, financing, operations, and maintenance—may vary from contract to contract, but in all cases the private party is accountable for project performance and bears significant risk and management responsibility. PPP contracts typically allocate each risk to the party that can best manage and handle it—risk transfer to the private party is not a goal, but is instrumental for full transfer of management responsibility and for the alignment of private interests with the public interest.

PPP Benefits

Yescombe (2007) states that the term ‘public-private-partnership’ appears to have originated in the United States, initially relating to joint public and private sector funding for educational programmes, and then in the 1950s to refer to similar funding for utilities, but came into wider use in the 1960s to refer to public-private joint ventures for urban renewal.

The World Bank Group Public-Private-Partnership in Infrastructure Resource Centre (PPPIRC) states that Public-private partnerships (PPPs) are a mechanism for government to procure and implement public infrastructure and/or services using the resources and expertise of the private sector. Where governments are facing ageing or lack of infrastructure and require more efficient services, a partnership with the private sector can help foster new solutions and bring finance.

PPPs combine the skills and resources of both the public and private sectors through sharing of risks and responsibilities. This enables governments to benefit from the expertise of the private sector, and allows them to focus instead on policy, planning and regulation by delegating day-to-day operations.

In order to achieve a successful PPP, a careful analysis of the long-term development objectives and risk allocation is essential. The legal and institutional framework in the country also needs to support this new model of service delivery and provide effective governance and monitoring mechanisms for PPPs. A well-drafted PPP agreement for the project should clearly allocate risks and responsibilities.

PPP Characteristics

Khanom (2010) observed that Public Private Partnerships (PPPs) have become widely accepted and popular in the management public sector. There are some common agreements in most PPP literature which focus on inter-organisation arrangements. First, PPP is cooperation between organisations. The second aspect is sharing risks. Risk sharing is viewed as an important incentive for both the public and private sectors, since it is assumed that risk sharing could benefit both actors. The third prospect is that these types of cooperation can result in some new and better products or services that no single organisation either the public or the private could produce better alone. Finally, it has been noted that in a PPP a partnership involves a longer term commitment which can continue for a number of years, e.g. 10 to 30 years. Some definitions of PPP stress the financial relationships. There are promises that PPP reduces pressure on government budgets because of using private finance for infrastructures and they also provide better value for money in the provision of public infrastructure. These usages of PPPs are prominent in the literatures on infrastructure building. These mostly include BOT (Build-Operate-Transfer), BOOT (Build-Own-Operate-Transfer) and BOO (Build-Own-Operate) models of the PPPs.

III. A REVIEW OF POLICY INITIATIVES FOR PPPS IN ASEAN COUNTRIES**Indonesia**

Indonesia is ASEAN’s largest economy. Its national development is mapped out in the Master plan for the Acceleration and Expansion of Indonesia Economic Development 2011–2025 (MP3EI) and the National Medium-Term Development Plan (RPJMN 2015–2019), as well as by the National Long-Term Development Plan (RPJPN 2005–2025). The RPJMN 2015–2019,

reckons that the financing requirement for the next 5 years will be around IDR5,300 trillion (approx. US\$440 billion), out of which the state budget and local budget may cover around 44 percent of it. The remaining portion, meanwhile, is expected to be fulfilled by private sector (34 percent) as well as state-owned enterprises (22 percent). For meeting the requirements, the Government of Indonesia, has considered PPP as one of the key approaches, and has taken steps to streamline its institutional and regulatory frameworks. Its plan for national infrastructure development is for development of physical infrastructure (including transportation, roads, water resources and irrigation, water and waste management, ICT, electricity, oil and gas, and renewable energy), and also development of social infrastructure (including urban, educational, tourism, sports, health facilities, and public housing). The regulation also enables two types of infrastructure to be bundled as one PPP project.

Malaysia

The Public Private Partnership (PPP) programme in Malaysia is an important component of the Malaysia Incorporated concept – a development approach introduced in 1983. PPP in Malaysia is defined broadly as an arrangement where the private sector provides services and invests in infrastructure assets, which would traditionally have been undertaken by the government. An important characteristic is the continuing interest of the government, directly in the form of an equity holding or indirectly in the form of operational oversight in the projects. These features differentiate PPP projects from the privatization model, whereby the government no longer has control or interest in the entity.

The PPP model has been applied in a wide range of public projects, such as the development of administration complexes, university campuses (including student residential buildings), hospitals, highways and bridges, integrated transport terminals, port facilities, medical equipment and supplies, solid waste treatment and public cleaning, power generation, and a 'guest worker' monitoring system. Four distinct PPP models have been adopted. These are:

a. Concession Model: This model is used for highways and bridges and it is normally structured on the build–operate–transfer (BOT) concept.

b. Accommodation Model: This is used for administration complexes, teaching hospitals, and university branch campus projects. The model is typically structured on the build–lease–maintain–transfer approach. The government has introduced the build–lease–operate–maintain–transfer approach for this model too.

c. Process Plant Model: This particular model is being used for power generating projects. It is structured with two forms of payment, a fixed capacity payment and a utilization payment.

d. Usage Model: This model is suitable for projects with high risk of technology obsolescence where the government is not planning to take ownership of the underlying asset upon the expiry of the contract, such as for services in sophisticated medical facilities. Investment is recouped from charges imposed on the utilization of the facilities by the ultimate users, that is, by levying user charges.

Philippines

Philippines has identified public–private partnership (PPP) as a key component of its overall strategy for inclusive growth. The Philippine PPP Centre, which is tasked with facilitating the country's PPP program and projects, estimates that 30 to 40 percent of the country's transportation, roads, and social infrastructure could be funded through PPPs.

The Duterte Administration aims to address the infrastructure requirements of the Philippines through accelerating the country's annual infrastructure spending to account for 5% of the Gross Domestic Product with Public-Private Partnerships playing a key role. By virtue of the Executive Order No. 8 series of 2010, as amended by Executive Order No. 136 series of 2013, the PPP Centre is mandated to facilitate the implementation of the country's PPP Program and Projects.

To bring in the right technical expertise the PPP centre has partnered with the Asian Development Bank (ADB), Association of Southeast Asian Nations (ASEAN), Australia – Department of Foreign Affairs and Trade (DFAT), Global Affairs Canada, Japan International Cooperation Agency (JICA), Foundation for Economic Freedom (FEF), Cities Development Initiative for Asia (CDIA). The PPP sector has also partnered with private sector partners like business councils, chambers of commerce and association of constructors etc. Several PPP projects at the Local Government Units have been taken up in the BOT mode. These local level infrastructure projects are like development of public markets, city hall, and regional government centres, bus terminals, cold storage, hospital, information and communication technology, power distribution, water works and sewage. Other PPP projects for infrastructure development are light rail transit, new airports development and operations and maintenance, bus rapid transit, expressways.

Singapore

The Singapore government has been interested in the PPP model for a number of years. The Best Sourcing Framework of 2003 stated that the public sector is to engage private sector providers to deliver non-core government services where the private sector can do so more effectively and efficiently. According to the Ministry of Finance's Public Private Partnership Handbook, published in October 2004 and updated in March 2012 (the PPP Handbook), the PPP procurement model is to be considered for public infrastructure projects with a value in excess of SGD50 million (approximately US\$40 million). The 2004 version of the PPP Handbook lists sectors where the PPP model can be applied as including sports facilities; incineration plants, water and sewerage treatment works; major information technology infrastructure projects; education facilities, including student accommodation facilities; hospitals and polyclinics; expressways; and government office buildings.

Thailand

In Thailand, PPP is a term that has historically been used in a broad sense to cover concession-based private investment in public infrastructure, made on the basis of traditional project finance structure. These traditional forms of project financing have played a major role in many sectors of the Thai economy for more than a decade, most notably in the energy, telecommunications, and transport sectors.

The first PPP law enacted by the Thai government to guide public-private participation and investment was the Public Participation in State Undertaking Act B.E. 2535 (1992) also known as the PPSU Act. This act was brought in to regulate PPP activities utilizing public assets in projects exceeding B1 billion (approximately US\$33.3 million) in value. However, since the main purpose of this PPSU Act was to prevent government corruption in granting rights to private investors for operation or use of state properties, rather than to provide an enabling environment for PPP projects, only certain types of PPP project involving state properties (for example, build-operate-transfer (BOT) and build-transfer-operate (BTO) schemes) are covered by the Act. Several other types of scheme such as build-own-operate (BOO) and management contracts are not covered. The new PPP Act, the Private Investments in State Undertakings Act B.E. 2556 (2013), took effect on 4 April 2013 to replace the old PPSU Act. The private sector is allowed and expected to play a large role in the programme through the new PPP scheme.

Brunei Darussalam

The Brunei Darussalam economy is heavily dependent on revenues from the oil and gas sector. The government's concerns about the economy's unhealthy dependence on oil and gas led to the launch of a long-term development vision, Wawasan Brunei 2035. The vision seeks to find a sustainable path for the non-oil economy aiming to achieve three key goals: educated, highly skilled, and accomplished people; a high quality of life; and a dynamic and sustainable economy. The infrastructure development strategy is identified as one of the eight policy focuses in this vision. Wawasan 2035, Policy Direction No. 6 mentions 'promoting research, development and innovation both in government-funded institutions and through public-private and international partnerships.' Policy Direction No. 40 touches on the 'adoption of legal and regulatory frameworks to promote investment in social and industrial infrastructure, including privatization and PPP in line with international best practice'.

Cambodia

PPP in Cambodia is at a relatively undeveloped stage. Currently, PPP can be implemented in the following sectors where infrastructure facilities provide direct or indirect services to the public: power generation, power transmission, and power distribution; transportation facilities and systems such as roads, bridges, airports, ports, railways, and man-made canals; water supply and water treatment; infrastructure for telecommunications and information technology; infrastructure facilities for tourism projects such as tourism sites and museums; infrastructure for the gas and oil sectors such as oil and gas pipelines; sewerage, drainage and dredging; solid waste management and treatment; public infrastructure related to health, education, and sport sectors; infrastructure related to special economic zones and social housing; irrigation and agriculture related infrastructure; and other sectors for which a specific law allows for the granting of concessions. The Law on Concessions, enacted in October 2007, provides the main legal framework related to infrastructure investment in Cambodia. Its purpose is to promote the development of privately financed infrastructure projects in the country. The concession contract in the framework is defined to include build-operate-transfer (BOT), build-transfer-operate (BTO), modernize-operate-transfer (MOT), lease or management contract, or other forms.

Lao PDR

The Lao People's Democratic Republic (Lao PDR) has a population of only 6.7 million people, of which nearly 80 percent is engaged in the agricultural industry, with US\$1,500 GDP per capita. Under the socialist regime, its economic growth has been slow and is one of the least developed countries in Asia. A PPP regime with government policies or regulations is not established in the Lao PDR yet. Infrastructure projects have historically concentrated in power, telecommunications, airports, and railways in the form of limited companies, where the government or designated state company holds voting equity interest as a shareholder. However, recent developments, including the development of a PPP decree and pilot PPP projects, show that the government may be taking an interest in developing its PPP sector. But it is still a challenge for the government to develop policy and legal frameworks for PPP. The Lao PDR government is currently developing the framework for PPP with support of the Asian Development Bank (ADB). The initiative focuses on three main areas: (i) institutional capacity building, (ii) policy and legislation framework development, and (iii) demonstration of model and/or pilot projects in social sectors, education, and healthcare.

Myanmar

The expansion of the Myanmar economy has led to growing demands for supporting infrastructure. However, it has become apparent that public infrastructure delivery alone cannot meet the needs for fulfilling the current massive infrastructure deficit. Some foreign investment projects have already been implemented in the power, port, and telecommunications sectors through existing laws. A comprehensive regulatory framework on the PPP scheme has not been established yet, while simple build-operate-transfer (BOT) schemes exist in each sector. Some BOT projects have been implemented in sectors such as port, electricity, and road. Nevertheless, most of the projects were under unsolicited mode and appropriate risk sharing has not been taken into account. The immediate priorities are expected to be in urban transportation systems, upgrading national airports and construction of new airports, and water utilities.

Vietnam

The Vietnam government has a target to be an industrialized country by 2020. In order to achieve the target, various policies have been adopted and are under implementation. One of the most important policies relates to building necessary infrastructure to boost economic development. According to the Ministry of Planning and Investment (MPI), the estimated necessary capital for infrastructure construction in Vietnam by 2020 is calculated as US\$400 billion, of which half is planned to be mobilized from the private sector mainly in the form of BOT projects.

IV. INFRASTRUCTURE DEVELOPMENT IN ASEAN

Infrastructure investment for construction and maintenance is one of the most important components of a country's economic development. As in so many other areas, there are huge gaps among ASEAN countries in the amount and quality of the available infrastructure needed to support efficient economies (Table 1).

Table – 1 Infrastructure Index for ASEAN Countries
(Ranking and score for the Global Competitiveness Report 2013 – 2014)

COUNTRY	RANK	SCORE
Singapore	2	6.41
Malaysia	29	5.19
Thailand	47	4.53
Brunei Darussalam	58	4.29
Indonesia	61	4.17
Vietnam	82	3.69
Lao PDR	84	3.66
Philippines	96	3.40
Cambodia	101	3.26
Myanmar	141	2.01

Lao PDR = Lao People's Democratic Republic

Note: Rank is based on a sample of 148 countries and score ranges from 1 to 7 with the latter indicating highest efficiency.

Source: World Economic Forum, 2013. The Global Competitiveness Report 2013-2014. Geneva

http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2013-14.pdf

accessed from ADBI Report 2014. ASEAN 2030 -Toward a Borderless Economic Community. Asian Development Bank Institute, Japan,

As per the Asian Development Bank Institute (2014) report ASEAN 2030, the need for physical infrastructure — roads, railways, ports, airports, and energy lines — varies dramatically across ASEAN countries. The Asian Development Bank Institute (ADBI) suggests that Asia's overall investment requirement for infrastructure between 2010 and 2020 is approximately \$8 trillion — with ASEAN countries covering a considerable share of the total. While about half the total infrastructure needed is for providing electricity, transportation (mostly roads) covers about 30% of the total, telecommunications 13%, with the rest needed for water and sanitation. Efficient connectivity requires regionally coordinated investment in infrastructure, such as cross-border roads and railroads, world-class ports and airports, telecommunications, and systems that diversify energy supply and lower its costs.

ASEAN Geography Demands Cross Country Cooperation

For many member states it is their geography which dictates the requirement of the infrastructure. Each country has its constraints in terms of land resource and seamless connectivity. For example, Singapore is severely constrained in terms of its land size and natural resources while Indonesia and the Philippines are archipelagos comprising of thousands of islands and Lao PDR being landlocked has to necessarily depend on other countries to meet its exports and imports. Fujimara and Edmonds (2006) call this “economic geography” while examining impact of cross-border infrastructure projects in the Greater Mekong Sub-region (GMS). They assert that there is much potential for cross-border road infrastructure and associated institutional arrangements to benefit economies that are not endowed with geographic characteristics favourable to economic development.

V. CROSS-BORDER INFRASTRUCTURE PROJECTS

Fujimura and Adhikari, (2010) define cross-border infrastructure as either an infrastructure project with activities spanning two or more countries, or a national infrastructure project that has significant cross-border impact. Zen and Regan (2014) state that the importance of such cross-border infrastructure in ASEAN was recognised in the ASEAN Master Plan on ASEAN Connectivity (MPAC), adopted by the ASEAN member countries on 28 October 2010. It identified transport (primarily road and rail), ICT and energy as the key sectors of focus, and prioritised six regional projects as important in facilitating physical connectivity of ASEAN. The Master Plan envisions that these projects will lead to enhanced connectivity, which will eventually promote economic growth, and contribute to narrowing the development gaps in ASEAN.

However, these cross-border infrastructure projects cannot be dealt with under the same consideration as a national infrastructure project, because of characteristics such as:

- Externalities (which include environmental and social impacts) spreading over wide geographical areas (beyond physically connected areas) and over various stakeholders.
- Strong influences from the geopolitical situation of two or more countries on project initiation.
- Large-scale investment with huge initial capital requirements and a long-term horizon.
- Necessity of cross-country coordination in policy or institutional arrangements, and soft infrastructure alignment.

As such, cross-border infrastructure projects, by definition, involve more than one government, which makes them inherently more challenging than similar projects located within a single country. The increased number of stakeholders signifies the complexity with respect to economic, social, or environmental benefits/losses and their management. These projects, furthermore, presume procurement and management of significant amount of resources, such as land and financial capital, which are often cited as major constraints even to domestic projects in the ASEAN context. A successful implementation of cross-border projects, therefore, requires a high level of cooperation among relevant authorities, effective stakeholder management, or a realistic planning and procurement strategy.

Even the World Bank has recognised the importance of cross-border infrastructure and has created in July 2016 the Global Infrastructure Connectivity Alliance (GICA) which strives to promote cooperation, knowledge exchange, and meaningful progress in the field of global inter-connectivity. GICA is a G20 initiative and its Secretariat is hosted by the World Bank Hub for Infrastructure and Urban Development in Singapore. Global Infrastructure Connectivity refers to the linkages of communities, economies and nations through transport, communications, energy, and water networks across a number of countries. It incorporates the inseparability of services -- in trade, logistics, human mobility, and information -- from the underlying infrastructure to improve the flow of goods, people, data, and capital. Successful connectivity combines planning for scale economies, development of sustainable infrastructure capacity, efficient use of such capacity, and economic inclusion aspects. GICA too has recognised and accepted the role the private sector can play in this by mentioning that "Other entities including private sector bodies and think tanks will be encouraged to participate in GICA's specific activities as contributors based on their core competencies."

Ferroni, (2002) states that the greater complexity of cross-border infrastructure projects arises due to factors such as coordination between multiple bureaucracies, compensation/cost-sharing between affected countries, and synchronizing project work across different countries and contractors. All this makes such projects riskier than projects based in a single country. Participating countries face different political and economic circumstances and cycles, and often have starkly contrasting abilities to negotiate and implement projects. Fujimara and Edmonds (2006) mention that the task of correctly accounting for the economic and financial benefits and costs of cross-border infrastructure projects is also made correspondingly more difficult by these project characteristics. Asymmetries in the benefit-cost incidence across countries must be delineated and addressed in the design and implementation of investments in cross-border transport infrastructure, such as those currently underway in the GMS.

Factors Supporting Private Sector Role in Cross Border Projects

Despite the difficulties arising from the nature of cross-border projects, there is ample reason to invite private party involvement in these projects in ASEAN. First, large-scale funding requirements for cross-border projects could be fulfilled through mobilisation of private financial resources. Second, technological challenges in cross-border infrastructure (such as in an offshore marine environment, or need of effective integration with national infrastructure) call for innovative approaches proposed by international, as well as domestic, private enterprises. Third, a cross-border infrastructure project, when managed exclusively by the public sector, could give rise to governance issues at the inter-governmental level. If a single private concessionaire somehow controls the project and the roles of each stakeholder are stipulated prior to a contract, then this could overcome such coordination problems. Lastly, and most importantly, significant spill-over benefits to geographically wide areas, coinciding with the ongoing process of economic integration in ASEAN, which is striving for the free movement of goods, services, skilled labour and investment, will produce strong demand and room for profit-based investments to the cross-border facilities themselves.

The issue is, cross-border projects, once they start to seek a PPP approach, become even more vulnerable to a number of risk factors stemming from the complex nature of PPP arrangements. It should be worthwhile noting that most of the above-mentioned impediments are related to public capacity in initiating, coordinating, or designing a project, rather than mere commercial aspects. The challenge is how to avoid such government failures in a situation where there is diversity in readiness, experience, or even willingness to adopt PPPs among nations such as in ASEAN.

Current Scenario

Currently cross-boundary projects are only to the extent of usage of the facility output by another country and hence such projects are not shared infrastructure in the true sense. For example, about 85% of power generation in Lao PDR is exported to neighbouring countries and Singapore has plans for a high speed rail link covering a route of around 300 kilometres between Kuala Lumpur in Malaysia and Singapore, which will shorten the journey between the two cities to 90 minutes.

VI. SHARED INFRASTRUCTURE

If we accept that a cross-boundary project would fall under the ambit of shared infrastructure then it can be stated that the concept of shared infrastructure is not new. Sharing of infrastructure amongst the stakeholder entities has now become the norm in the ICT sector and it has evolved into various working models. According to Garcia and Kelly (2015) infrastructure sharing is one of the main trends in broadband infrastructure deployment. In developing countries, particularly in sub-Saharan Africa, there is a trend for governments to back infrastructure sharing projects as a way to reduce costs in network deployments, expand coverage, reduce the rural-urban digital divide, and accelerate broadband take-up through the infrastructure asset sharing, mutualisation and cooperative models.

Types of Sharing Models in the Telecom Infrastructure

- 1) Infrastructure asset sharing happens when two or more competing operators providing a telecommunication service share assets that are required to provide the service.
- 2) Infrastructure mutualisation is a particular type of infrastructure sharing and happens when a common network infrastructure is built, operated, and maintained by a third party, an infrastructure provider, and jointly used by telecommunication service providers. Service providers lease a portion of the mutualised infrastructure and pay a wholesale price for it.
- 3) Infrastructure cooperation, arises when telecommunication infrastructure is housed or jointly constructed with other linear infrastructures in order to exploit the potential synergies in the construction, operation, and maintenance of several networks at the same time.

The World Bank has supported several infrastructure sharing projects in Africa through Public Private Partnerships (PPP) under the principles of open access, non-discrimination and low-cost pricing. Infrastructure sharing contains three interrelated dimensions: commercial, regulatory and technical. Each of these dimensions can be analyzed from a static and dynamic perspective because markets evolve and technology changes. In the case of shared infrastructure in the ASEAN region the infrastructure cooperation model shows potential to bring full scale benefits to all the stakeholders.

The International Energy Agency in its report 'Development Prospects of the ASEAN Power Sector (2015)' mentions that the power sector is fundamental to the energy outlook for Southeast Asia. The demand for power is projected to grow faster than any other final form of energy, accounting for 58% of growth in total demand. The Association of Southeast Asian Nations (ASEAN) needs to add 354 Giga watts of additional capacity for power generation by 2040, which more than doubles today's capacity and calls for investments of USD 618 billion in generation and USD 690 billion in the transmission and distribution of this power. The report envisages that an interconnected power system could further enhance the development and integration of its variable renewable power generation capacity. This would enhance not only the sustainability of ASEAN's power sector but also increase its general electricity security. Towards this it has identified five different models of coordination amongst ASEAN member countries that can be used for the trade of electricity between two or more countries. These are: (1) unidirectional trades based on electricity cost differences, (2) bilateral, bidirectional power trades between national utilities, (3) imports from IPPs (Independent Power Producers) in neighbouring countries, (4) trade with one or more intermediary countries, (5) multi-buyer, multi-seller market. The report cautions that there is no single model that all ASEAN countries should adopt – at least not in the short term. Rather, cross-border trading among the ASEAN can be facilitated under some or all of these models, which can be implemented between countries with very different market structures. A basic requirement, however, is that country-level regulations and legal arrangements do not prevent cross-border trading or introduce strict barriers to this trade.

A UN Water Thematic paper (2008) states that trans-boundary water management can directly or indirectly contribute to international trade, economic development, food security, political security, poverty alleviation and regional integration and that public participation is fundamental to maximize agreement, enhance transparency and decision making, create ownership and facilitate the acceptance and enforcement of decisions and policies.

The IAEA 2006 (International Atomic Energy Agency) discussed the potential of sharing nuclear power infrastructure between countries. The burden of infrastructure can be reduced significantly if a country forms a sharing partnership with other countries. The sharing can be at regional or at multinational level. It can include physical facilities, common programmes and knowledge, which will reflect in economic benefits. The sharing can also contribute in a significant manner to harmonization of codes and standards in general and regulatory framework in particular.

Cross Border cooperation in developing and sharing is common to nations which are in close proximity and as given in Table 2, the example of Europe under the European Union can be taken to highlight the extent of involvement of various countries in this regard.

Table – 2 Case Examples of European Union Cross-Border Infrastructure Projects

Sr. No	Cross Border Infrastructure Project	EU Member States Involved nos., (Countries)	Implementation Schedule	Budget (€)	EU Contribution (€)
1	LNG filling station infrastructure in the Baltic Sea	2, (Denmark, Belgium)	Jan 2010-Dec 2015	26.8 million	9.6 million
2	Brenner Base Tunnel (cross border base tunnel)	2, (Austria, Italy)	April 2011-Dec 2015	560.7 million	168.1 million
3	Seine-Scheldt canal project (linking river transport networks)	2, (France, Belgium)	Jan 2007-Dec 2015	503.5 million	176.6 million
4	Electric Recharging for road transport in EU (trans-national network of fast charging stations)	5, (Austria, Croatia, Germany, Slovakia, and Slovenia)	March 2014-Dec 2015	7.1 million	3.56 million
5	The Fehmarn Belt Fixed Link project is a dual rail/road connection across the 18 km wide Fehmarn strait in the Baltic sea	2, (Denmark, Germany)	June 2008-Dec 2015	486 million	2014.8 million
6	International market-oriented establishment of 9 Rail Freight Corridors (RFCs)	10, (Austria, Germany, Denmark, Belgium, Slovenia, The Netherlands, United Kingdom, Slovakia, Italy, Hungary)	May 2011 – Dec 2013	12.98 million	6.49 million
7	The CROCODILE project cross-border coordination of Intelligent Transport Systems (ITS) strategies,	10, (Austria, Cyprus, Czech Republic, Germany, Greece, Hungary, Italy, Poland, Romania, Slovenia)	Jan 2013 – Dec 2015	31.42 million	6.28 million
8	Construction of an 80 km section of railway between France and Italy, with a 57.1 km base Tunnel dug through the Alps. It is part of the broader Lyon to Turin rail link, running along the TEN-T Mediterranean Corridor.	2, (Italy, France)	Jan 2007 – Dec 2015	890.47 million	400.97 million
9	Upgrading the maritime link between Helsinki and Tallinn North Sea-Baltic Corridor	2, (Estonia, Finland)	Jan 2012-Dec 2015	56.30 million	11.26 million
10	Interoperable 1,200 kilometres of North-South railway line, one of the key elements of the North Sea-Baltic TEN-T Corridor linking the European Union from east to west. At its northern end, Helsinki and Tallinn are joined by means of rail ferry services, thus bridging the gap between Baltic and Scandinavian countries.	5, (Estonia, Latvia, Lithuania, Poland, Finland)	Feb 2009 – Dec 2015	303.63 million	93.28 million

Source: Compiled by Author based on data from European Commission's "Better Together" report prepared by Innovations and Networks Executive Agency, ISBN 978-92-92-08014-3, doi:10.2840/316418

If trans-boundary sharing of the usage or output of the infrastructure facility has to be possible it stands to reason that only certain types of infrastructures will be amenable to sharing and the corollary is that not every kind of infrastructure facility can be shared. This will be largely dictated by the content and carriage nature of the facility. As such, power projects, port projects, airport projects, ICT projects can all have multi-country users whereas projects linked to roads and highways, waterways would be constrained in this regard. In the social infrastructure segment projects for healthcare, tourism and education too would be amenable to sharing with the lead being taken by those nations which have developed sufficient expertise in this aspect.

VII. B-O-C-R ANALYSIS of SHARED INFRASTRUCTURE

Wijnmalen (2007) mentions that a full BOCR analysis is in some ways similar to a SWOT analysis, where not only the strong points (S) of a firm but also its (external) opportunities (O) are taken into account such as good chances of entering a new market and other favourable situations. Opportunities in BOCR analysis usually catch expectations about positive spin-off, future profits

and revenue of future positive developments; whereas benefits represent current revenue or those profits from positive developments one is relatively certain of. Likewise, a firm's weak (W) points may not tell the whole story of negative aspects in SWOT analysis; external threats (T) concerning competition or unfavourable developments in society must be dealt with as well. Risks in BOCR analysis are supposed to catch the expected consequences of future negative developments, whereas costs represent (current) losses and efforts and consequences of negative developments one is relatively certain of. BOCR analysis enables therefore a potentially richer analysis than a mere BC analysis, although many of the aspects that define the factors and their relationships are usually difficult to specify and quantify. A full BOCR analysis can be done using a $(B * O) / (C * R)$ ratio where positives not only include benefits but opportunities as well, and negatives not only costs but also risks. A major problem that arises is that often benefits and costs are difficult to express in monetary terms, especially when some of the benefits or costs are intangible, such as "improved accuracy" or "learning efforts".

In this paper, based on the constructs delineated from the views and the policy discussion above a BOCR Classification of the factors for cross-border shared infrastructure is given below:-

BENEFITS

1. Scale and size of the projects can be increased
2. Faster economic equilibrium of member states
3. Geographically constrained nations get a bigger footprint
4. Leveraging of the best knowledge, talent and skills available
5. Reduced and shared burden of financial investments

OPPORTUNITIES

1. Growth of ASEAN polity
2. Growth of the private sector in partnerships
3. Project swapping by member nations

COSTS

1. Administrative costs associated with centralised secretariat
2. Creating a suitable legal framework of international treaties
3. Obtaining public approvals
4. Passing of suitable legislations by member nations

RISKS

1. Land Expropriation by host nation
2. Environmental Damage - Subsisting/On going
3. Insufficient Income from User Levies
4. Insufficient Demand for Facility
5. Sequestration by host nation
6. Exclusivity
7. Adverse Government Action/In Action
8. Pricing of Services for Users
9. Currency Normalisation
10. Increase in Taxes
11. Emergence of any single nation dominance

VIII. SHARED INFRASTRUCTURE – AHP BASED MODELLING

Saaty (2008) states that to make a decision we need to know the problem, the need and purpose of the decision, the criteria of the decision, their sub-criteria, stakeholders and groups affected and the alternative actions to take. We then try to determine the best alternative, or in the case of resource allocation, we need priorities for the alternatives to allocate their appropriate share of the resources.

Decision making involves many criteria and sub-criteria used to rank the alternatives of a decision. Not only does one need to create priorities for the alternatives with respect to the criteria or sub-criteria in terms of which they need to be evaluated, but also for the criteria in terms of a higher goal, or if they depend on the alternatives, then in terms of the alternatives themselves. The criteria may be intangible, and have no measurements to serve as a guide to rank the alternatives, and creating priorities for the criteria themselves in order to weigh the priorities of the alternatives and add over all the criteria to obtain the desired overall ranks of the alternatives is a challenging task.

Mei et al (1989) state that the application of the Analytical Hierarchy Process (AHP) has been involved in many fields, i.e. energy planning, resource allocation, alternative waste treatment policies, talent promotion, human migration, health insurance, and business. The reason for this is due to the characteristics of the method itself, summarized as follows.

(a) **Simple formulation.** AHP reflects the human way of thinking, which makes it possible to be applied to the real world, and it provides a medium for "conversations" between planners, decision makers and analysts or researchers.

(b) **Systematicity.** It decomposes a large system into a framework within which one can consider a diversity of interrelated factors of engineering, environmental, economic, political and social nature, and analyze their complex mutual interactions and impacts. In spite of the explicitness involved in the basic idea, it contains a profound philosophic theory.

(c) **Practicality.** It can be applied to nearly any aspect related to evaluation of alternatives and the planning-making process.

The Analytic Hierarchy Process (AHP) developed by Saaty (2006) has been advocated as an approach that not only can deal with both tangibles and intangibles but also helps organize all aspects involved in a hierarchic structure where the benefit or cost aspects act as criteria and the projects as alternatives. Usually, we have separate hierarchies: one costs hierarchy and one benefits hierarchy. One has to pair-wise compare the importance of cost criteria in the cost hierarchy, and the same with respect to the benefit criteria in the separate benefits hierarchy. These processes produce relative criteria weights expressed on a derived ratio scale, usually normalized to the unity sum for each family of criteria in each hierarchy. The alternative projects are pair-wise compared with respect to each criterion on the lowest level of each hierarchy; their derived priorities are expressed on a ratio scale as well, again usually normalized to the unity sum per criterion. Synthesis of the alternative priorities and the criteria weights using a weighted sum produces composite alternative priorities for each hierarchy. For each alternative, its composite benefit priority is then divided by its composite cost priority. The resulting ratio value serves as a means to rank the alternatives and choose the best one, i.e. the alternative with the highest benefit/cost-priority ratio.

MODEL DIMENSIONS

GOAL

G1: Create, develop and operate multi-nation infrastructure facilities with private sector involvement.

CRITERIAN (Constraints)

C1: Legal framework

C2: Ownership framework

C3: Project scope and feasibility framework

C4: Project financing framework

ALTERNATIVES (Scenarios)

A1: Country Location and its sovereign neutrality

A2: Multi-Nation ownership

A3: Private entity ownership (consortiums)

A4: Construction models

A5: Operation models

IX. CONCLUSION

The model dimensions provide an initial framework of BOCR classification and model dimensions for researchers to develop and test a model of cross-border shared infrastructure using specific case studies of cross border shared infrastructure projects. It is hoped that this discussion paper will further trigger debate, research and policy formulation on the issue of shared infrastructure to overcome the infrastructure development constraints of individual nations and leverage the expertise, strength and knowledge for the overall benefit of all the ASEAN member states.

REFERENCES

- [1]. ADBI Report 2014. "ASEAN 2030 -Toward a Borderless Economic Community". Asian Development Bank Institute, Japan.
- [2]. ASEAN Investment Report 2015. "Infrastructure Investment and Connectivity". ASEAN Secretariat and the United Nations Conference on Trade and Development (UNCTAD), and supported by the Government of Australia through the ASEAN-Australia Development Cooperation Program Phase II (AADCP II).
- [3]. Fauziah Zen and Michael Regan (eds.) 2014. "ASEAN Public-Private Partnership Guidelines". Economic Research Institute for ASEAN and East Asia (ERIA).

- [4]. Ferroni, M. 2002. “*Regional Public Goods in Official Development Assistance*”, in M. Ferroni and A. Mody, eds. *International Public Goods: Incentives, Measurement, and Financing*. Dordrecht, NL: Kluwer Academic Publishers.
- [5]. Fujimura Manabu and Edmonds Christopher 2006. “*Impact of Cross-border Transport Infrastructure on Trade and Investment in the GMS*”, ADB Institute Discussion Paper No. 48
- [6]. Fujimura, M., and Adhikari. R. 2010. “*Critical Evaluation of Cross-Border Infrastructure Projects in Asia*”. ADBI Working Paper 226. Tokyo: Asian Development Bank Institute.
- [7]. Garcia Jose Marino and Kelly Tim 2015. “*The economics and policy implications of infrastructure sharing and mutualisation in Africa*”. Background paper, Digital Dividends, World Development Report 2016.
- [8]. Khanom Nilufa Akhter 2010. “*Conceptual Issues in Defining Public Private Partnerships (PPPs)*”, International Review of Business Research Papers, Vol.6, No. 2, July 2010, pp 150-163.
- [9]. Mei, X. R. Rosso, G.L. Huang and G.S. Nie 1989. “*Application of analytical hierarchy process to water resources policy and management in Beijing, China. Closing the Gap between Theory and Practice*” (Proceedings of the Baltimore Symposium, May 1989), IAHS Publ. no. 180, 1989, pp 73-83.
- [10]. National Public-Private Partnership Frameworks In ASEAN Member Countries - 2015 – by Economic Research Institute for ASEAN and East Asia (ERIA).
- [11]. Report of the International Energy Agency, Development Prospects of the ASEAN power sector – towards an integrated market. OECD/IEA 2015.
- [12]. Saaty Thomas L 2008. “*Decision making with the analytic hierarchy process*”. Int. J. Services Sciences, Vol. 1, No. 1. Pp 83-98.
- [13]. Saaty Thomas L. 2007. “*Multi-decisions decision-making: In addition to wheeling and dealing, our national political bodies need a formal approach for prioritization*”. Mathematical and Computer Modelling, Issue 46, pp 1001-1016.
- [14]. The IAEA 2006 (International Atomic Energy Agency). “*Potential for Sharing Nuclear Power Infrastructure between Countries*”. IAEA-TECDOC-1522, Vienna.
- [15]. UN Water Thematic Paper 2008. “*Transboundary Waters: Sharing Benefits, Sharing Responsibilities*”.
- [16]. Wijnmalen Diederik J.D.2007. “*Analysis of benefits, opportunities, costs, and risks (BOCR) with the AHP-ANP: A critical validation*”. Mathematical and Computer Modelling Issue 46 pp 892-905, Elsevier Ltd, doi:10.1016/j.mcm.2007.03.020
- [17]. Yescombe E. R. 2007. “*Public-Private Partnerships: Principles of Policy and Finance*”, Elsevier.

Websites Accessed

- [1]. Global Infrastructure Connectivity Alliance (GICA) <http://www.worldbank.org/en/topic/transport/brief/global-infrastructure-connectivity-alliance>
- [2]. https://aric.adb.org/crossborder_infrastructure_beta
- [3]. https://ppp.gov.ph/?page_id=8
- [4]. <https://www.adb.org/publications/critical-evaluation-cross-border-infrastructure-projects-asia>
- [5]. <http://www.asean.org/asean-economic-community/>
- [6]. <http://www.mofa.go.jp/region/asia-paci/asean/conference/asean3/plan07111.pdf>
asean plus three
- [7]. http://ppp.gov.ph/?press_releases=providing-a-solid-foundation-for-infra-in-ph&so=0 Vivek Pathak Director for East Asia, International Finance Corp., Pacific.
- [8]. The World Bank PPP Knowledge Lab <https://pppknowledgelab.org/guide/sections/1-introduction>
- [9]. The World Bank Group Public-Private-Partnership in Infrastructure Resource Centre (PPPIRC) <https://ppp.worldbank.org/public-private-partnership/about-public-private-partnerships>