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Asian Public-Private Partnerships: An Overview of Trends and Innovations

MANUEL J. DE VERA
FACULTY, ASIAN INSTITUTE OF MANAGEMENT

PHILAMER C. TORIO
GRADUATE STUDENT, UNIVERSITY OF BRITISH COLUMBIA

MICHAEL O. TIMBANG
RESEARCH ASSOCIATE, AIM POLICY CENTER

CHARLES IRVIN S. SIRIBAN
RESEARCH ASSOCIATE, AIM POLICY CENTER

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THE AUTHORS

MANUEL J. DE VERA
Asian Institute of Management
Center for Development Management

PHILAMER C. TORIO
University of British Columbia

MICHAEL O. TIMBANG
Asian Institute of Management
Policy Center

CHARLES IRVIN S. SIRIBAN
Asian Institute of Management
Policy Center

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Manuel J. De Vera
Philamer C. Torio
Michael O. Timbang
Charles Irvin S. Siriban

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ABSTRACT

The research involves an archival review and analysis of 104 Public-Private Partnership (PPP) projects in Asia to determine general trends in investment, financing, and government support. Representing a total investment of about US$79.37 billion, these projects were implemented over a period of 26 years from 1985 to 2011, covering mainly the transportation, water, and energy sectors. Five major indicators were selected and used for screening the different Asian PPP projects. Plotting these indicators on a pentagram offered a graphical representation of these trends, allowing for a better understanding of the dynamics between risk mitigation measures and financing strategies.

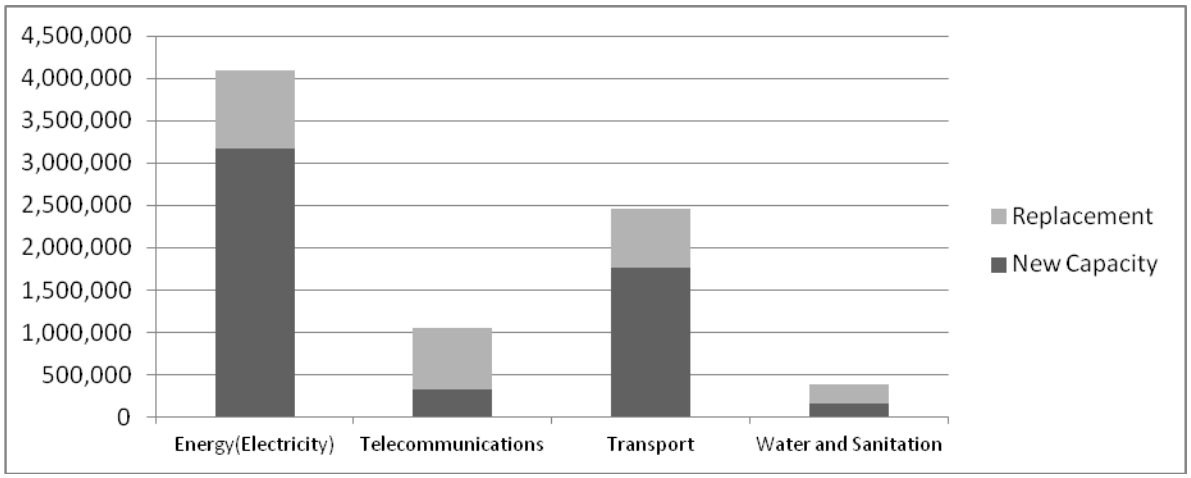
Across the different sectors, PPP projects in the transportation sector exhibited the longest cooperation period and received the most government support, ranging from guarantees to direct financing and equity investment. Placing second to transportation projects, energy projects also received substantial government support enabling the implementation of many greenfield projects in Asia. The results also showed a general pattern of greater local ownership across the transportation, energy, and water sectors. A country analysis of the different PPP projects included in the study showed that India provided the most government support, followed by China and the Philippines, respectively.

I. Introduction

At present, the lack of access to primary public goods remains a key issue in many developing countries. Based on statistics, 2.5 billion people lack access to sanitation services, 1.6 billion live without electricity, 1 billion people lack access to roads, and 900 million people drink unsafe water. In the next 25 years, another 2 billion people will be born, 97% of which come from developing countries, needing water, electricity and transport services (Public Private Infrastructure Advisory Facility). In the Asian context, infrastructure investment requirements exceed available public financial resources. Given the region's rapid economic growth, Asia needs about US$8 trillion worth of investments (see Figure 1), particularly in the transportation, telecommunications, water and energy sectors to maintain its progress for the coming years (Public Private Infrastructure for Advisory Facility). In response to rising demand for infrastructure development and limited public budget, there is a growing interest in the role of the private sector in financing, managing, and developing public infrastructure projects through Public-Private Partnerships (PPPs).

Canadian Council for Public-Private Partnerships defines Public Private Partnership (PPP) as any cooperative venture between the public and the private sectors that builds on the expertise of each other. In this case, the goal of the cooperative venture is to best meet "clearly defined public needs through the allocation of resources, risks, and rewards" (Canadian Council for Public-Private Partnerships). PPPs may also refer to arrangements where the private sector supplies infrastructure assets and services that traditionally have been provided by the government (IMF 2004). Moreover, such partnerships are means by which the public and private entities can work together as they provide a contractual and formalized framework needed for easier cooperation between all parties (UNESCAP 2006).

Figure 1. Asia's Total Infrastructure Investment Needs by Sector, 2010-2020 (in 2008 US $ millions)



Notes: (1) Telecommunications include mobile phones and landlines.

(2) Transport includes airports, ports, railways and roads.

Source: Public Private Infrastructure for Advisory Facility

In this regard, a better understanding of public-private arrangements is vital to understand how such partnerships can work best to provide better goods and services to the public.

The study seeks to address this issue by doing an extensive review and analysis of various Asian PPP projects, drawing on a novel database of over 100 Asian PPP projects put together by the staff of AIM Policy Center, to determine general trends in investment, financing and risk mitigation. The study applies an innovative pentagram scheme, which makes use of several key indicators to determine baseline conditions, forecast future trends, monitor systems across spatial and temporal scales and conduct performance reviews among others.

Some of the key findings of the study are listed as follow. Transportation projects have the longest cooperation period among the projects in the database and have received the highest number of government support identified in this paper. Placing second to transportation projects, energy projects have received substantial assistance and incentives from the government leading to the implementation of many greenfield plants even outside Asia. In terms of ownership, greater local ownership is observed in PPP projects belonging to three main sectors: transportation, water, and energy. Lastly, in the case of India, many of its PPP projects have received substantial government support, ranging from guarantees to direct financing and equity investments.

The paper is organized as follows: Section II describes a quick view of PPP history in Asia, then draws on basic features of PPP structures, including common PPP variants, as well as advantages, financing schemes, and risk transfer in order to have a broader picture of such partnerships. Section III describes the research methodology, data, and choice of indicators. Section IV provides sector and country analyses of the Asian PPP projects, featuring insightful findings of the study. Section V concludes and presents areas for future research.

II. Public-Private Partnerships: Some Key Aspects

Early Beginnings of PPPs in Asia

PPPs in their present forms may often be viewed as comparatively new addition to a constant evolving relationship between the public and the private sectors. However, by looking at the past, one can see a long history of private sector participation in infrastructure development. In Asia, for example, private initiatives in the provision of public services were first introduced in 1853, when The Great Indian Peninsula Railway Company introduced the first railways in India near Mumbai with British capital and organization. Under a scheme that guaranteed an annual return of 5 per cent, the government of India encouraged the setting up of railways by private investors. Furthermore, the government also compensated the private companies for acquiring land necessary for the construction of railway lines and establishments. Once completed, ownership of the railway company was transferred to the government, but the operation remained under the control of the company that built them. Essentially, they were implementing an arrangement that we now know as the Build-Transfer-Operate (BTO) scheme (UNESCAP 2008).

PPPs: Basic Features

A typical PPP takes the form of a Design-Build-Finance-Operate (DBFO) scheme, under which the public partner (the government in many cases) would specify the public goods and services that the private partner will provide. Private actors may refer to private businesses, non-governmental organizations (NGOs), and community-based organizations (CBOs). The private party would then design and build a specific asset, finance its construction, operate the asset and

provide the services deriving from it.[1] This kind of arrangement gives the private sector combined responsibility for designing, building, financing, and operating the project, with the objective of increasing efficiency in the provision of public services (IMF 2004).

In many cases, the government is the main purchaser of public goods provided under such partnerships. These services can be purchased either for the purpose of government's own use, as an input to provide another service, or on behalf of final consumers (e.g., school, prison, hospital, etc). A PPP project such as a toll road or railway is also a classic type, where private partners sell services directly to the public. This arrangement is often referred to as a concession, in which the private operator of the concession (referred to as concessionaire) remunerates the government by paying a concession fee and/or sharing the profits with them. In general, the private operator owns the PPP asset during the cooperation period and then transfers the asset at the end of the concession (IMF 2004).

Box 1: PPP projects based on contract type

- **Service contract**: Portions of operation of an existing facility are delegated to the private sector partner. In this case, ownership of asset remains with the government and as such, the public sector partner remains to be primarily responsible for capital investment. Projects of this type have short duration (usually 1 to 3 years) and in this case, private sector partner can induce quick and substantial but limited contributions to the efficiency of the system.

- **Management contract**: In this case, the task of managing a part of or the whole public enterprise is delegated to the private sector partner. Projects of this type also have short duration and public sector partner remains the owner of the asset and the entity responsible for capital investment. Operational risk stays with the government but given the role played by the private sector partner in managing the facility, operational gains can be attained even without transferring the ownership to the latter.

- **Lease contract**: The government delegates the responsibility of managing and operating an already existing facility to the private sector partner. However, asset ownership and responsibility of capital investment is still with the public sector partner. In this case, private sector partner handles the operational risk of the project and receives compensation from the government equal to the revenue of the facility less lease payment to the government.

- **Concession contract**: In this case, full delivery of services of an existing facility is delegated by the government to the private sector partner. This includes operation, maintenance and management of the facility and construction of new facilities within the existing project. Projects of this type also include greenfield projects which involve construction and operation of a new facility by a private entity or a public-private joint venture. Projects with concession contracts generally have long cooperation period (25 to 30 years) and in this case, significant investment risk is assumed by the private sector partner. For greenfield projects, the facility may or may not be transferred to the public sector partner at the end of the contract period.

Sources: Asian Development Bank (2008), UNESCAP (2008) and Farquharson et al (2011)

[1]This arrangement is in contrast with traditional public investment where the government contracts with the private sector to build an asset but the design and financing is provided by the government. See for instance the report conducted by the International Monetary Fund (2004).

Moreover, the term PPP is also used to describe a broader range of arrangements. Besides differences in structures and contract forms, each PPP variant implies varying levels of responsibility and risk assumed by the private operator and public sector. To reflect the best local requirements in a PPP variant, contracts are increasingly becoming hybrids (Asian Development Bank 2008). For this purpose, the paper focuses on the basic types of PPP based on contract type and based on scheme. Projects classified based on scheme usually have concession type of contracts. The basic features of these PPP types are summarized in Box 1(classification based on contract type) and Box 2 (classification based on scheme).

Box 2: PPP projects based on scheme

- **Build-Operate-Transfer (BOT)**: The responsibility of constructing and operating a new facility is delegated to the project company during the contract period after which, the facility will be transferred to the government. Ownership of the facility may or may not remain with the government during the contract period.
- **Build-Transfer-Operate (BTO)**: In this case, construction risk is delegated to the private sector partner after which the ownership of the new facility is transferred to the government. The government in turn allows the private sector partner to operate the facility within the contract period to allow the latter to recover costs incurred in constructing the project and earn profits.
- **Build-Lease-Transfer (BLT)**: This scheme is similar to BTO except that the government leases the facility to the private partner during the rest of the contract period.
- **Build-Own-Operate (BOO)**: The project company is largely responsible for the construction and operation of the new facility. As opposed to BOT projects, the project company owns the facility during the cooperation period. Revenue guarantees are usually provided by governments for projects of this type.
- **Rehabilitate-Operate-Transfer (ROT)**: The project company is responsible for the rehabilitation and operation of an existing facility within the duration of the contract period.
- **Rehabilitate-Lease or Rent-Transfer (RLT)**. The private sector partner leases the facility from the government. In this case, the private partner is largely responsible for the rehabilitation and operation of an existing facility within the duration of the contract period.
- **Build-Rehabilitate-Operate-Transfer (BROT)**: This scheme is largely similar to ROT, except that the project company is also responsible for construction of add-on facilities to the existing project.

Sources: Asian Development Bank (2008) and Farquharson et al (2011)

Motivations for Engaging in PPPs

In an effort to solve social problems through PPP arrangements, the advantages of the private sector-innovation and competency, access to project financing, and managerial, technical efficiency and know-how are combined with the social responsibility, environmental awareness, and local knowledge of the government. PPPs are structured to attract private capital investment (often to either supplement public resources or release them for other public needs), to increase

efficiency and use available resources more effectively, and to reform sectors through a reallocation of roles, incentives, and accountability (Asian Development Bank 2008).

A well-structured PPP project provides a number of benefits, including risk diversification, risk mitigation, and innovative project financing, among others. For one, the creation of a Special Purpose Vehicle (refer to Box 1 for a more detailed description)[2] for the project allows many different investment parties to come together and facilitates the allocation and diversification of risk and financing requirements to more than one party. Where the financial requirements or risks might be too large for any one party by itself, this diversification of risks enables the undertaking of projects (UNESCAP 2006).

Box 3: Special Purpose Vehicle (SPV)

Projects in some PPP variants (such as Concession and BOT) make use of Special Purpose Vehicles (SPVs). SPV refers to the project company set up by project sponsors to implement the project contract. Project sponsors acquire shares representing ownership in the SPV in exchange for leading the project and contributing long-term equity capital.

From a legal perspective, it is the SPV that undertakes the project and as such, all contracts with other parties (such as lenders, contractors and government) will be negotiated between the latter and the SPV. On the other hand, SPVs can not undertake any business which is not part of the project. Thus, the existence of SPV is tied to the PPP project itself.

SPVs may not be directly owned by the project sponsors as the latter can use holding companies for such purpose. Furthermore, Special Purpose Vehicles are not limited to private sponsors of the project; the government can also contribute to the long-term equity of the said legal entity in exchange of ownership of a portion of the project company's shares. In this case, the SPV is considered as a joint venture between the private and public sectors.

Special Purpose Vehicles are utilized for PPP projects whose lenders rely only on the cash flow and security over its assets for the repayment of debts (i.e., limited recourse or non-recourse lending). Also, SPVs make projects possible, especially those that require very large amount of investments (in terms of project cost and management and operational skills required) relative to a project sponsor's capacity. It allows different investors with varying technical and management capacities to jointly invest and share the project risks among themselves.

Sources: UNESCAP (2006) and UNESCAP (2008)

Intended to keep certain risks of the project separate from the existing business of the private sponsors, the SPV facilitates the use of project financing (refer to Box 2 for a more detailed description). In this case, the sponsors' credit rating will not be affected by the

[2]IMF defines an SPV as a consortium of banks and other financial institutions, set up to combine and coordinate the use of their capital and expertise, built to facilitate a well-functioning PPP.

borrowing since it is the SPV that is borrowing the funds. Thus, the financial integrity of project sponsors will not be jeopardized should the project fail, making such arrangement beneficial (UNESCAP 2006).[3]

A PPP option is seen as an innovative way of financing infrastructure projects. In a PPP financing scheme, projects are financed using a mix of debt and equity instruments, called capital structure, regardless of who provides the funding. Depending on the project and project's sources of funding, stage of development, access to financial markets, and project sponsors' own corporate finance strategy, the optimum level of debt and equity for the financing is determined. Based on their claim to assets, different sources of capital have different characteristics and a different risk/return profile. In this regard, debt capital is seen to be 'cheaper' than equity since debt is less risky than equity as debt holders have a prior claim to revenue and assets. In addition, debt financing has covenants governing some of the decisions of the management (UNESCAP 2006).

Box 4: Project Finance

Project finance refers to a range of financing structures wherein lenders depend on the performance of the project, particularly on the cash flow it will generate, with limited or even without recourse to the project sponsors. As such, this financing structure is also referred to as **limited recourse** or **non-recourse financing**.

In this case, the lenders need to evaluate the technical and financial aspects of the project such as sources of revenue streams, operating arrangements and other project features necessary to assure that there will be sufficient cash flow to cover debt service. Thus, PPP projects that utilize project finance are usually characterized by complex loan and security documentation (often involving several lenders and investors) and a detailed process of risk allocation among the different project participants (including purchasers, input suppliers, contractors and operators).

Project finance allows sponsors to utilize their resources and expertise in undertaking profitable investments that they will not be able to undertake on the strength of their balance sheets. Furthermore, project finance investments are usually classified as off balance sheet financing (i.e., large capital expenditures are not included in the balance sheet) so that such investments will not affect project sponsors' credit and thus, limit their debt exposure. Likewise, the process of risk allocation allows project sponsors to shift some risks to project lenders in exchange for a higher margin obtained by the lenders (relative to normal corporate lending). Thus, in case of failure of the PPP project, project sponsors suffer losses together with project lenders.

Sources: Delmon (2005) and USAID and World Bank (1994)

[3]United Nations. Public-Private Partnerships: *A Financier's Perspective.*

Efficiency gains constitute another key motivation in pursuing a PPP project as the arrangement enables the private sector to manage the aspects of the project where the government has weak record (De Jong 2008). In cases where the construction and operation of an asset are both delegated to the private sector (as in the case of BOT and its variants), the public sector can also take advantage of advanced management skills and innovative practices of the former (Checherita 2009). However, many PPP projects have little scope for competition (with competition for some variants limited to the bidding process) given that economic infrastructure are usually characterized by large sunk costs. In this case, it is necessary for the government to utilize incentive-based regulation (i.e. implementing policies that will increase project output to the social optimum and limit price increases while preserving incentive for the project company to minimize cost) to assure the attainment of the purported efficiency gains of the project (IMF 2004).

Risk Transfer and Guarantees: Key Elements of a PPP

Another important condition for a PPP option to be a more efficient and cost-effective alternative in the government's provision of social services is adequate risk transfer from the government to the private sector. Many PPP projects are characterized by long-term contracts designed to assure sufficient revenue streams to cover financing costs and profit requirements of project sponsors. However, long-term contracts are characterized as incomplete given different possibilities (such as change in government perception of PPPs and an external shock that can cause demand to veer away from its predicted level) that are not predicted by the "bounded rationality" of the economic agents involved in the project (Araujo and Sutherland 2010; Llanto 2008). Chan et al (2011) classified the various risks into two general categories; namely, systematic or country risks (i.e., risks related to the objective market environment) and specific project risks (i.e., risks related to the nature of the project and to the different stages of a project). In this case, the first type of risk is not within the control of the private partner. The different types of risks under each category are listed in Table 1.

Figures 3 and 4 show that the highest level of risk can be found during the construction and start-up phase of a project, which can be attributed to construction delays and cost overruns having serious consequences on a project. Moreover, investors require the highest return on their capital to compensate for the risk during this phase necessitating a higher cost of capital for the

private partner (UNESCAP 2008). Figure 5 on the other hand shows an intricate relationship among the different parties involved in PPP projects where construction and operation of an asset are bundled and delegated to the project company as well as the different risks associated with the said structure.

Table 1: General categories of risks in a PPP project

Systematic Risks		**Specific Project Risks**	
Risks	**Example**	**Risks**	**Example**
Political risks	Nationalization/expropriation	Construction risks	Non-availability of material or labor
Economic risks	Financing risk	Operation risks	Operation cost overrun
Legal risks	Legislation change	Market risks	Market competition
Social risks	Political opposition	Relationship risks	Third party delay or violation
Nature risks	Force majeure	Others	Lack of supporting infrastructure

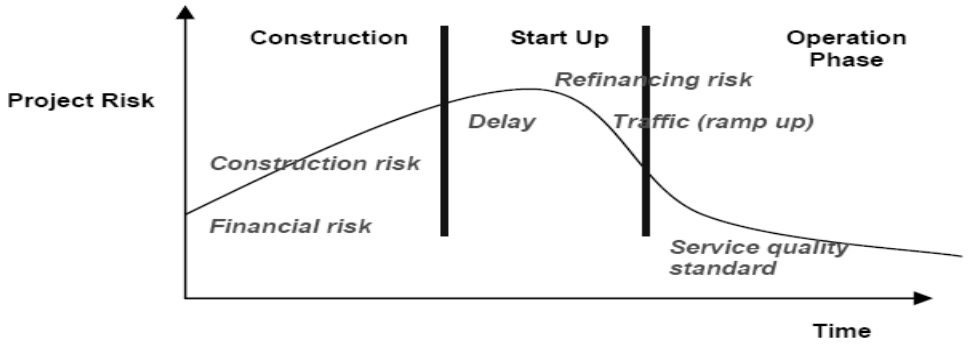
Source: Chan et al (2011)

An important condition in mitigating the various risks is to allocate each of them to the party most capable of handling it in a cost-effective manner (Panggabean 2006). For instance, demand risk (i.e., risk that actual demand may not meet demand forecast) should be handled by the government if it is the buyer of the services and its actions and policies can affect the demand level. If the actions of the private partner can affect the demand level as in the case of toll roads (where the private partner, if it is also the project contractor, can improve road quality), demand risk must be handled by the latter. But this will hold only if the risk aversion of the private partner and demand uncertainty is insignificant. Otherwise, the government can provide a minimum revenue guarantee to the private partner (Araujo and Sutherland 2010). Table 2 shows some mitigation measures that can be taken for certain types of risks. Through explicit government guarantees, the risks incurred by the private sector can be reduced or eliminated. Therefore, a guarantee provided by the government may be important for a well-structuring and functioning of a PPP project.

The use of guarantees in mobilizing private capital has been used to support capital structure and funding, thereby, reducing financial risks for the private sector. In the Asian

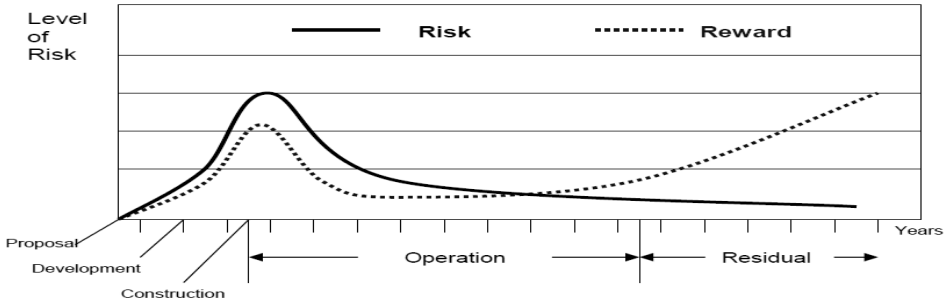
context, these instruments enlarge capacity for project financing. Asia remains a hot market for local and international investors due to its rapid economic growth and large demand for social infrastructure. Hence, PPP will play a significant part in the infrastructure development of the region.

Figure 3. Project Risk



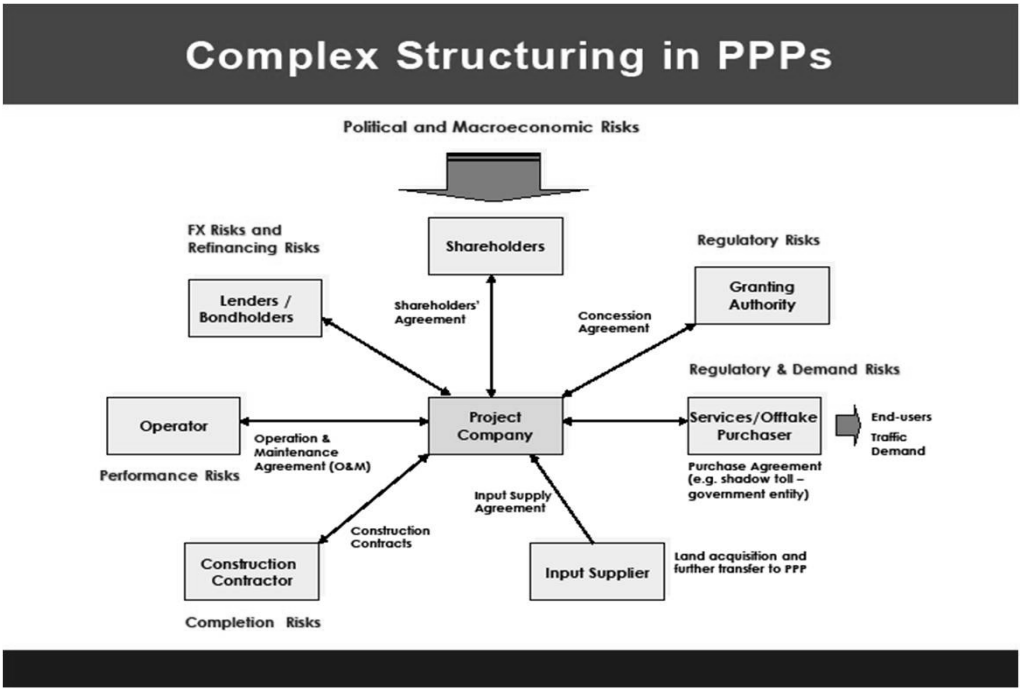
Source: UNESCAP (2006)

Figure 4. Project Development Cycle: Risk vs. Reward



Source: UNESCAP (2006)

Figure 5: Complex Structuring in PPP



Source: PPIAF

Table 2: Selected Risks of a PPP project and associated mitigation measures

Risk	Description	Mitigation measure
Construction and completion risk	Design problems, construction cost overrun, project delay	Selection of project contractor among the project sponsors to decrease information asymmetry
Financing risk	Variability in interest rates, foreign exchange rates, inflation and other factors that can affect financing costs	Use of loan guarantees; Indexation of tariff to concerned variables (such as inflation, foreign exchange rate and interest rate); Provision of supply of foreign exchange by the government
Performance and operating risk	Technical failures and instances when project does not perform based on expectation	Warranties from contractors and suppliers; Use of performance guarantees in Operation and Maintenance (O and M) contracts
Political risks	Deviation by the host government on the project agreement	Use of sovereign government guarantees or guarantees from export credit agencies and multilateral institutions
Regulatory risks	Vulnerability of rules (e.g. tariff-setting) to political intervention	Creation of independent regulatory agencies
Residual value risk	Risk that the fair value of the asset will fall below its estimated value at the end of the contract	Guarantee from the government on the price at which it will purchase the asset at the end of the contract

Sources: Araujo and Sutherland (2010), IMF(2004) and Llanto (2008)

III. The Asian PPP Experience

This research involves an archival review and analysis of 104 Public-Private Partnership (PPP) projects in Asia to determine general trends in investment, financing and risk mitigation. Representing a total investment of at least US$79.37 billion, these projects were implemented over a period of 26 years from 1985 to 2011, covering mainly the transportation, water and energy sectors. As shown in Table 3, the transportation sector accounted for the largest number of projects and investment amounts, followed by energy and water, correspondingly.

Table 3. Selected Asian PPP Projects

Sector	No. of Projects	Investments (*US$ Billions)*
Transportation	37	35.57
Water	30	12.52
Energy	32	29.26
Others	5	2.02
Total	**104**	**79.37**

Source: Authors' elaboration

Methodology

While there is uniform recognition and understanding of the different types of risks inherent in each individual PPP project, the manner of addressing those risks are variegated and diverse. Every PPP project is unique in its own way and its structure is influenced by a country's governing laws, government's investment programs and policies, local and global economic conditions and financial markets, and other factors that can affect the risk profile of the project at the time of its implementation.

Despite the uniqueness of each individual project, there are certain risk factors that are prevalent and dominant when PPP projects are taken as an agglomeration. As such, certain trends may emerge when these projects are viewed and analyzed on a sector or country basis. These emerging patterns offer a general understanding of the perception of risks by the public sector, private investors and the financial institutions with regard to their participation in these projects. In the course of establishing these trends, it should always be remembered that implementation strategies may vary across countries and regions for a given period of review, particularly when

examined at different time frames. Simply stated, the trends exhibited by these projects may vary according to the spatial and temporal scales that are defined for a particular review.

Critical to the study was the identification of indicators that would help establish trends for analyzing 104 Asian PPP projects that were included in the study and implemented from 1985 to 2011. Normally, indicators are used to determine baseline conditions, forecast future trends, monitor systems across spatial and temporal scales, conduct performance reviews and provide warning signs. In the context of public policy, they also provide value-free metrics for decision-making and help set policy directions (Milman and Short 2008).

In the course of the review, a matrix of information for the PPP projects was developed and analyzed. The study considered and compared 19 different classes of information for each project, related to transactional structure, implementing government agency, project sponsors, financing, government support, tariff formulas, and other facts of major significance. Indicators were selected based on their relevance and utility in establishing recognizable patterns and logical conclusions. A major factor in the final choice of indicators was the availability of the desired information. Some difficulty in acquiring information for the projects was consistent with a study by Izaguirre and Kulkarni (2011) which shows that only 33% of the PPP projects that reached contractual closure have publicly available information related to their financing. Based on the aforementioned considerations, the following indicators were identified and used to establish the general patterns of investment, financing and incentives for the selected PPP projects:

- PPP Variant – Based on the duration of the cooperation period between the government agency and the private company as well as the PPP modality that governs the contractual arrangement and the scheme for projects with concession contracts
- Debt Percentage – Percentage of debt capital with respect to the total capital employed
- Percentage of Foreign Ownership – Based on predominance of private companies that had 100% foreign ownership; value at 0% for predominance of companies with 100% local ownership and 100% for predominance of companies with 100% foreign ownership
- Government Support – Based on the guarantees, subsidies and direct equity provided by the government to support the PPP project
- Tariff Policy – Based on the adjustments allowed by the regulatory regime to cover certain movements of tariff components

The values that were assigned for the PPP Variant, Debt Percentage, and Percentage of Foreign Ownership indicators were those that were predominant (i.e., those that had the highest frequency of occurrence) based on the information obtained for the different projects. For the Government Support and Tariff Policy indicators, the different government support and tariff adjustment mechanisms were identified and considered as part of these set of indicators. It is important to remember that these indicators are intended to present general trends for the different sectors of the Asian PPP projects implemented from 1985 to 2011 for better understanding of the investment, financing and risk mitigation concepts related to these projects. The values assigned are not absolute and fixed and may change over time. They are influenced by a myriad of factors and therefore, should not be used to forecast future developments and directions for these projects.

After analyzing each indicator separately, there was a need to combine these indicators together to establish a holistic approach for comparing projects across sectors. The use of a pentagram was explored with the chosen 5 indicators being assigned 5 different points on the graph. Using a scale of 0 to 100, the indicators that were not scaled accordingly were indexed to those of the sector which offered the most desirable mix of financing or risk mitigation. Plotting the indicators on a pentagram would allow graphical representation of the summary of results and also facilitate better comparison and understanding of the general trends of PPP projects in different Asian countries over the last three decades.

IV. Findings

Sector Analysis of the 104 Asian PPP Projects

As shown in Table 4, the Build-Operate-Transfer mode was the predominant contractual arrangement for transportation and energy sector PPP projects and comprised a significant portion of water sector PPP projects considered in the study. Transportation projects have the longest cooperation period of 30 years as compared to water and energy projects whose cooperation period is usually for 25 years. A longer cooperation period may be considered a reflection of a higher risk profile as projects of this nature tend to have longer periods for recovery of investment and repayment of debt.

Table 4. Sector Indicators: PPP Variant, % Foreign Ownership, % Debt

SECTOR	BOT PROJECTS (Percent of Total)	% DEBT	% FOREIGN OWNERSHIP	COOPERATION PERIOD
Transportation	**65%**	70	0	**30 years**
Water	**33%**	67	0	**25 years**
Energy	**63%**	75	0	**25 years**

Source: Authors' elaboration

Transportation projects are characterized by high construction and market risks. In the past, many such projects have been associated with understated project cost estimates and overly optimistic traffic forecasts. As a result, these projects have been beset with cost over-runs and lower-than-forecasted revenues during actual project implementation, contributing to a perception of increased risks for similar projects. On the whole, such problems are common to both private and public sector investments (Flyvbjerg, Bruzelius & Rothengatter 2003).

Water projects are considered to have high market, regulatory, and political risks due to environmental and social concerns on water supply and affordability. Like transportation projects, water projects have had their share of successes and failures. Of the 65 countries that embarked in water privatization during the past two decades, 41 still maintain private operators while 24 have reverted back to public management with several contracts terminated early due to conflict between parties. With 84% of the awarded contract still active today, the private sector continues to serve 160 million people (equivalent to 7% of the total population of the developing countries) while the public sector has resumed providing service to 45 million people (Marin, 2009).

From 1990 to 2009, energy projects accounted for 32% of global private sector investment in infrastructure systems (World Bank 2012). In Asia, as of the end of 2008, 43% of all PPP projects were in the energy sector, followed by the transportation sector with 27% (Reside and Mendoza 2010). The large private sector participation in the Asian power sector may be attributed to the host governments' commitment to encourage private companies to invest these projects, a large pool of private developers in the sector, greater availability of information on the power industry of developing countries, and acceptable returns for private investors (Malhotra 1997). As such, the risk profile of energy projects is well-defined and

understood, enabling investors and creditors to deploy more equity and debt capital, respectively, in this sector.

In relation to equity investment, local players invested more in PPP projects despite the various risks associated with these projects. With over two decades of involvement in such projects, it is possible that local investors now have a better understanding of the different risks inherent in these projects and as such, are able to employ better risk mitigation strategies. Likewise, these investors are more familiar with the local political landscape and business environment. For the same reasons, debt financing for the Asian PPP projects are currently provided by Asian banks, with multinational creditors being more cautious and exercising selective lending in the region (Asia Finance and Risk Mitigation Forum 2012).

Creditors required higher equity levels from project sponsors for water projects, followed by transportation projects and lastly, energy projects. The water sector has experienced many failed water privatizations, making creditors more wary to lend to water projects with a slowing down of private sector investments in the sector. From 1990 to 2009, the water sector was able to attract only 4% of the total global private sector investment in infrastructure (World Bank 2012). In Asia, private sector investments in the water sector were behind those in the energy and transportation sectors and accounted for only 25% of all the PPP projects implemented as of the end of 2008 (Reside and Mendoza 2010).

Majority of the energy projects involved power generation by independent power producers which were initially dominated by foreign investors. When these global sponsors started reducing their portfolio of energy investments in developing countries, regional and local investors took their place and became more active in this sector (Tenebaum & Izaguirre 2007). With a relatively high success rate for these projects over the last three decades, debt financing for energy projects was easier to raise with less stringent conditions as compared to projects in transportation and water sectors.

Government support and tariff adjustments help mitigate the different types of risks inherent in PPP projects. Based on the 100 projects reviewed, government support was provided by way of guarantees, financing subsidies, right of way (ROW), land, and equity investments. Of the three major sectors that were reviewed, Table 5(a) shows that the transportation sector was provided with the most government support. The energy sector received the next highest level of support from the government with water receiving the least government support from among the

three major sectors analyzed. It may also be noted that transportation projects were allowed the most number of tariff adjustments, inclusive of those that relate to inflation, foreign exchange, interest rate, fixed annual increases, passenger volume and performance. While water projects were given some tariff adjustments, they were not at the level of those provided for the transportation projects.

Table 5(a). Indicators: Government Support

	Guarantee						Financing		Equity	ROW/ Land
	Credit	Rate of return	Revenue	Profit	Raw water/ fuel supply	Offtake	Direct financing	Viability gap		
Transportation	X	X	X	X			X	X	X	X
Water		X			X	X	X			X
Energy	X		X		X	X	X		X	X

Source: Authors' elaboration

Table 5(b): Indicators: Tariff Adjustments

	CPI	Forex	Interest rate movements	Annual rate increase	Passenger volume	Performance incentive
Transportation	X	X	X	X	X	X
Water	X	X		X		
Energy	X	X				

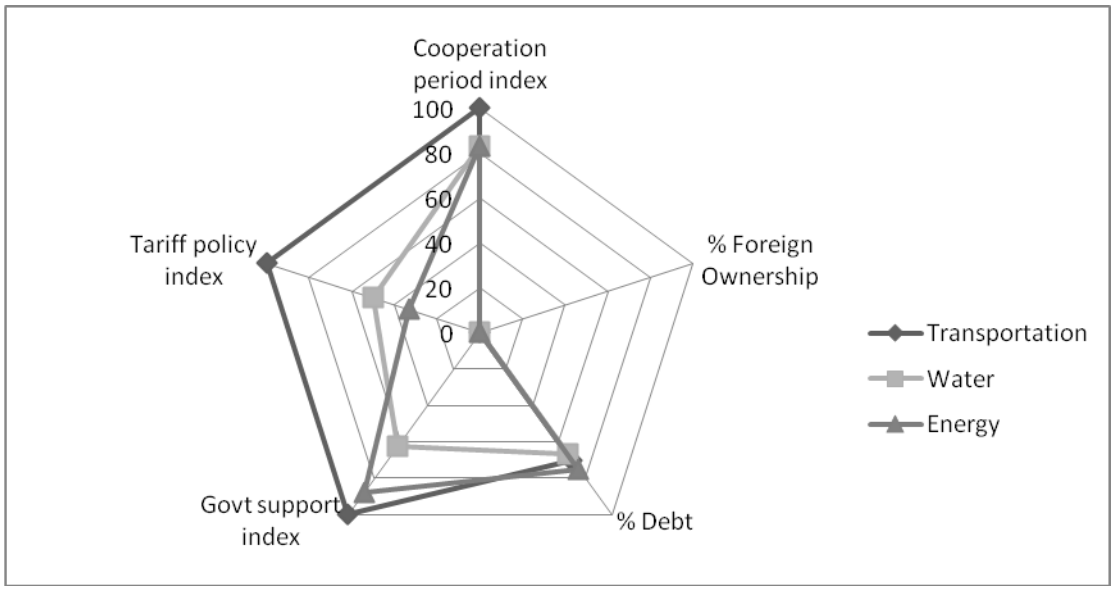
Source: Authors' elaboration

The government support and tariff adjustments accorded to the transportation sector have promoted higher levels of private sector investment and project financing vis-a-vis the water sector. While the demand for water may be higher than the demand for new roads and railways, the social, environmental and political nature of water may have also contributed to the difficulty of encouraging private sector participation and project lending for this sector. Of the 104 Asian PPP projects, the energy projects also obtained many government incentives; albeit, second only to the transportation projects. Nevertheless, these incentives have played a critical role for the successful construction of many greenfield power generation plants not only in Asia but throughout the world.

Using the five selected indicators, a pentagram was constructed to provide a graphical representation of the general patterns of investment, financing, and risk mitigation through government support and tariff adjustments. Figure 6 shows the pentagram for the sector analysis of the Asian PPP projects under review. This pentagram offers an overview of the trends across sectors using a single diagram and facilitates comparison of these trends.

The pentagram represents a snapshot of general trends on financing and risk mitigation for Asian PPP projects across the different sectors from 1985-2011. The % debt, % foreign ownership, and cooperation period index[4] provide general indications of the financing conditions for the different PPP projects while the tariff policy and government support indices[5] show the level of risks that were not transferred to the private investor but passed on to the consumers and the government.

Figure 6. Pentagram for the Sector Analysis



Source: Authors' elaboration

[4] Formula for Cooperation period index of sector i: $\text{Coop}_i = 100 \times \frac{\text{Predominant cooperation period in sector i}}{\text{Longest predominant cooperation period among the three sectors}}$

[5] The formula used in computing tariff policy and government support indices for each sector is similar to the formula used in computing the cooperation period index, with the government support index for the sector receiving the highest number of government support and with the tariff policy index of the sector having the most flexible tariff adjustments equal to 100%

Please note that the three indices were referenced to the transportation sector which had the longest contract period and the most number of allowable tariff adjustments and government guarantees, subsidies, and equity investment. In this regard, the transportation sector was assigned an index of 100.

As the scales are increasing from the center of the pentagram to its outer sides, the edges represent a desired scenario for financing and project support with respect to the 104 projects in Asia that formed part of the study. Without particular emphasis on local or foreign ownership of the service company implementing the PPP project, investors would like to finance these projects with a high level of debt covering a long repayment period. Likewise, they would like to mitigate the inherent risks associated with the projects using tariff adjustments and government support and as such, try to negotiate as much of these mechanisms into their PPP contract. These strategies provide for a higher return on invested capital for the private sponsors.

As Figure 6 shows, predominantly, transportation projects in the list are characterized by 30 years of BOT contract funded by 70% debt and 30% equity. These projects enjoyed a lot of government support and tariff adjustments. They were heavily invested in by local sponsors who have the ability to negotiate for very good terms because of their understanding of the local political landscape and business environment. Because of larger political, social, and environmental concerns associated with water projects, local investors have had to put in more equity in water projects vis-a-vis transportation projects despite similar levels of risks. Likewise, with fewer incentives provided by way of tariff adjustments and government support for these projects, debt levels for water projects were normally higher with shorter repayment periods. On the other hand, as many successful energy projects were already in place, this sector was characterized by established and well-understood government support and tariff adjustment mechanisms. These projects have also attracted many local investors and allowed creditors to relax their lending requirements.

Selected Country Analysis of PPP Projects in China, India and the Philippines[6]

In doing a per country analysis of the Asian PPP projects, China, India and the Philippines represent those that have the most number of projects in the list. The relatively high rate of success of implementing PPPs in these three countries, as earlier mentioned, can be a function of

[6] See Appendix for further details on the figures cited in this section

how the transaction was structured, the involved government agencies, projects sponsors, financing, government support, tariff formulas among others. This section will provide special focus to these three countries in identifying trends in Asian PPPs but would also refer to other countries in the region for comparative purposes.

Total cost

Figure 7 presents the list of PPP projects in the database from India, China and the Philippines and their respective cost. Cost of PPP projects in China ranges from $ 25 million to $653 million while a greater variation in terms of total cost can be observed for PPP projects in India and the Philippines whose range varies from $ 2.1 million to $ 3.315 billion and $10 million to $7 billion, respectively. Many PPP projects in China and India are local[7] in scope and a significant number of these projects have total cost not exceeding $100 million. On the other hand, many PPP projects in the Philippines have total cost greater than $500 million, mostly from the transportation and the energy sectors. An exception to this is the MWSS Privatization project in which the private partners are expected to invest $7 billion over a period of 25 years. A major success of this project is the significant increase in households that have 24 hour access to water service to 99% of households in the eastern zone as of 2006 and to 88% of households in the western zone as of 2012 (IFC 2010; *Philstar.com* 2012). Another Philippine PPP project whose total cost exceeds $1 billion is the 1200 MW coal-fired Sual Power Plant which, together with other large base load coal plants, was part of the first wave of IPP plants established after the energy crisis in the 1990s in response to expected demand growth (Woodhouse 2005).

India also has projects whose total cost exceeds $1 billion- the construction of the Dahej Liquefied Natural Gas (LNG) Terminal with a capacity of 10 million metric tons per annum and the establishment of a mass rapid transit system in the high traffic density corridors of the city of Hyderabad (UN-Energy 2011; Department of Economic Affairs 2010). While the list for China does not contain projects whose total cost exceeds $1billion, a significant number of projects have total costs exceeding $ 500 million, mostly from the transportation and the energy sectors. An exception to this is the National Stadium Project for 2008 Olympics which has the highest total cost in the list amounting to $653 million. Constructed through a Build-Operate-Transfer scheme, the project has received various government support, ranging from necessary

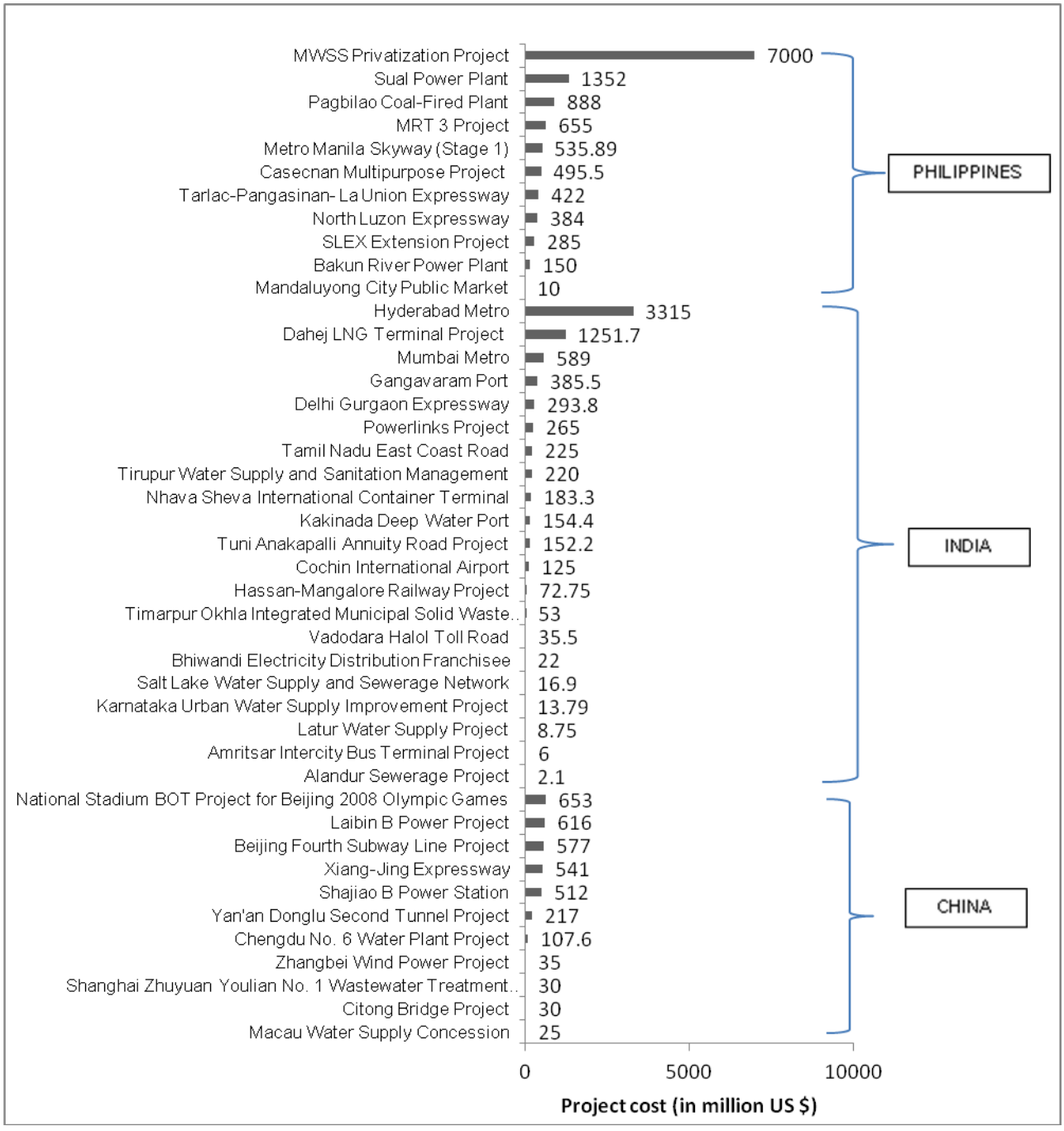
[7] Local in this case refers to any political unit smaller than the national (e.g. municipal, provincial, regional).

infrastructure connection to the project site to equity contribution which amounts to approximately 58% of the total project investment (Liu et al 2010).

PPP Variant

Of the total number of PPP projects in these Asian countries, preference is toward the Build-Operate-Transfer (BOT) scheme. India, which has the most number of projects in the list, has about 76% of all its projects under the BOT scheme with most of it (or total of 10 projects) in the transportation sector. On the other hand, China and the Philippines have 82% and 55%, respectively, of all its PPP projects in the list under the BOT scheme.

Figure 7: PPP projects in India, China and the Philippines



Source: Database compiled by staff of AIM Policy Center

Similarly with India, there is preference for the BOT scheme for transportation projects in China while in the Philippines, such a scheme is prevalent in the energy sector.

Private Ownership of PPPs

Most of the PPPs in the three countries are majority-owned by private companies. However, India is conservative in terms of private ownership of energy projects as seen in the case of the Powerlinks Project—the first PPP in the transmission sector of India—where the Tata Power Company holds 51% while the Government of India retains 49% ownership of the transmission service (World Bank 2010). Another project in India, the Dahej LNG Terminal Project, on the other hand has 50% government ownership (UN-Energy 2011).

A different pattern is seen in China, where transportation projects have substantial government ownership: the Yann'an Donglu Second Tunnel in Shanghai with a 50% government stake and the Beijing Fourth Subway Line project of which 51% is owned by the Beijing Municipal Government (Zhang et al 1998; Asian Development Bank, 2010). In the Philippines two transportation projects have minority government ownership through a parastatal entity—the North Luzon Expressway Project (NLEX) and the South Luzon Expressway (SLEX) Extension Project with 2% and 20% government ownership, respectively(North Luzon, Philippines Case Study; International Finance Corporation).

Other than China, government ownership in energy projects can be observed in Lao People's Democratic Republic (Lao PDR), Bhutan and Myanmar. For the water sector projects in the database, only Thailand is observed to be reserving government ownership in all its water-related PPP projects. In the transportation sector, the PPP port projects in Sri Lanka, Malaysia and Jordan retain 13%, 49% and 49% government ownership, respectively(Colombo, Sri Lanka Case Study; UNESCAP 2008; Aqaba, Jordan, Port Expansion Case Study).

Foreign Ownership of PPPs

Going through the list, 100% foreign ownership of PPPs is observed in energy projects in some countries in Asia. The Philippines has two coal-fired power plants, the Pagbilao and Sual Power plants which are wholly-owned by Team Energy, a joint venture between Tokyo Electric Power Co. and Marubeni Corporation of Japan (Team Energy website; Woodhouse 2005). From the list, countries such as Bangladesh, Oman, Bahrain, Jordan, Tajikistan and Bhutan also have energy projects which are 100% foreign-owned. On the other hand, China and India allowed 100% foreign ownership for some water projects.

Government Support and Tariff Policy

Government support, which may consist of concessional loans, direct financing and many forms of guarantees—from credit to profit guarantees, are distinctively different for the three countries in terms of extent, application (as it relates to conditions or the PPP variant) and duration. As Table 6 shows, China, India and the Philippines have PPP projects that received equity investment from the government and government assistance through right-of-way (ROW). In terms of financing support, India has PPP projects that received both viability gap and non-viability gap funding while China has PPP projects that received non-viability gap funding from the government, such as the Zhangbei wind power project which received partial subsidy on interest payments during construction (Asian Development Bank 2009). The Philippines provided viability gap funding- for the Tarlac Pangasinan La Union Expressway (TPLEX) by way of a of Php 2.9 billion subsidy for the construction of a particular section of the road (Project Finance 2012).

Table 6: Government support for PPP projects in China, India and the Philippines

	Guarantee						Financing		Equity	ROW/ Land
	Credit	Rate of return	Revenue	Profit	Raw water/ fuel supply	Off take	Direct financing	Viability gap		
China		X		X	X	X	X		X	X
India	X	X	X		X		X	X	X	X
Philippines	X	X				X		X	X	X

Source: Authors' elaboration

China and India provided the largest number of government guarantees. Moreover, only China provided a guarantee on profits (Beijing Fourth Subway Line Project) while only India provided a guarantee on revenue streams as in the case of Delhi Gurgaon Expressway[8] (Asian Development Bank 2010; Department of Economic Affairs 2010). Combining the various government supports identified in this paper (see Table 6), India tops the three countries with government incentives ranging from guarantees, financing subsidies (both viability gap and non-viability gap funding), right of way (ROW), land, and equity investments.

[8] For this project, the National Highways Authority of India made available a loan facility that can be tapped if the revenue generated by the project company falls short of the subsistence revenue level

In terms of tariff policy, Table 7 shows that all of the three countries have PPP projects whose tariff structure includes adjustment based on consumer price index or inflation. Some of these projects are found in the energy sector (such as Laibin B Power Project in China) which incorporate movements in price of fuel in their respective tariff structure. Foreign exchange adjustments in tariff are observed for some PPP projects in China (such as the Laibin B Power Project) and the Philippines (mainly road projects such as Metro Manila Skyway Stage 1) while adjustments based on passenger volume are observed for PPP projects in China and India. Only India has a PPP project whose tariff structure allows for movements based on performance of the project company- the Hassan Mangalore Railway Project. Similar to the results observed on government support, Table 7 shows that PPP projects in India have the most flexible tariff structures relative to those found in China and the Philippines.

Table 7: Tariff structure of PPP projects in China, India and the Philippines

	CPI	Forex	Interest rate movements	Annual rate increase	Passenger volume	Performance incentive
China	X	X			X	
India	X			X	X	X
Philippines	X	X				

Source: Authors' elaboration

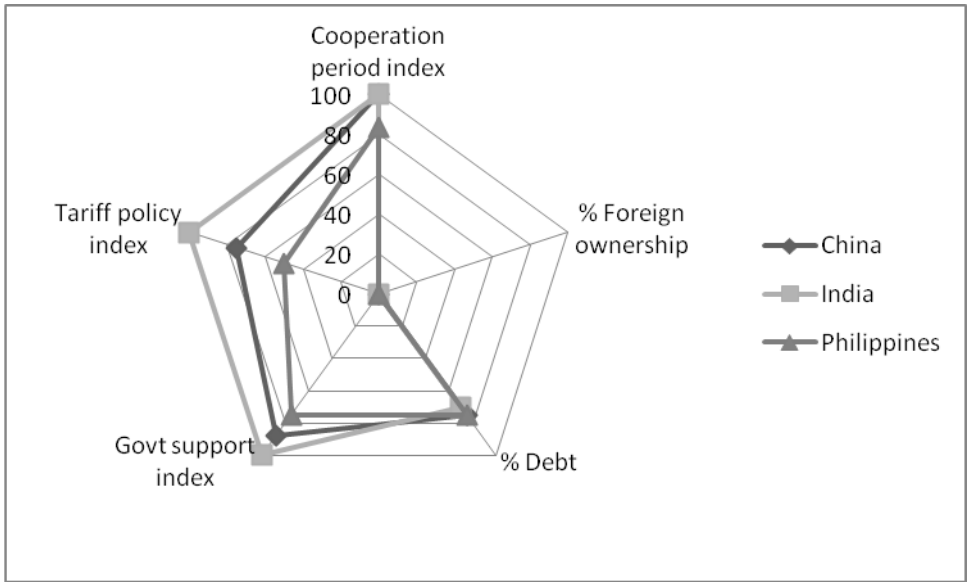
Synthesis

Figure 8 shows the pentagram for PPP projects in China, India and the Philippines based on similar indicators used for the sector analysis. Among the three countries, Indian PPP projects enjoy the greatest variety of government support and adjustments in their tariff structure. On the other hand, Philippine PPP projects appear to be the most conservative in terms of government support and tariff policy despite the fact that the Philippines was a primary mover in Asia on institutional rules on PPPs with the enactment of the so-called "BOT Law"[9] in the 1990s. The law was in response to the power crisis in the late 1980s, which forced the Philippine government to solicit private sector participation to facilitate the installation of power generation facilities. This further explains why there are significantly more power projects in the Philippines' PPP list vis-a-vis transportation and water projects.

[9] Republic Act No. 6957, as amended by Republic Act No. 7718 enacted in 1993.

On the other hand, similar to the results on PPP projects in the three main sectors (water, transportation and energy), greater local ownership is observed for PPP projects in China, India and the Philippines. The pentagram further shows that PPP projects in Philippines and China enjoy higher level of debt financing (75% of total project cost) relative to India (70%). Lastly, the cooperation period of many PPP projects in India and China is at 30 years, which is longer than the cooperation period of a significant number of PPP projects in the Philippines (25 years).

Figure 8: Pentagram for Country Analysis



Source: Authors' elaboration

IV. Conclusion

This seminal paper provides a snapshot of the trends in Asian PPPs not just on the demand for particular projects—water, transportation or energy—in a given context but on how PPPs are structured differently, i.e., on how private ownership is accepted or limited or to a large extent, how private foreign ownership is accepted or limited in a country. The study utilized information on 104 Asian PPP projects over the period 1985 to 2011 to determine trends on various indicators, among which are PPP variant, debt percentage, percentage of foreign ownership, government support and tariff adjustments. Some of the key findings of the exercise include:

- The longest cooperation period is observed for PPP projects in the transportation sector. These transportation projects are characterized by the provision of substantial

government support and tariff structures that help mitigate the many different risks for the private service providers

- While lagging behind transportation sector in terms of government support, PPP projects in the energy sector have likewise received substantial government support such as direct financing, equity contribution and guarantees, enabling the proliferation of many greenfield energy projects in Asia.
- Lastly, many PPP projects in the three main sectors (transportation, water and energy) tend to have greater local investor participation. These investors tend to be more familiar with the local political and business environment.

To help synthesize the analysis of PPP projects among different sectors, a pentagram framework was used to establish benchmarks and trends. Future work using the pentagram may involve re-examining the existing trends that were established with the 104 Asian PPP projects using more projects in the study group and determining whether these trends persist. Moreover, a comparison of the Asian PPP project trends to those of other regions in the world may be undertaken using this framework. Investigations of trends over different temporal scales may additionally inform practitioners and researchers of policies that contribute to the successful financing and risk mitigation of PPP projects.

Trends across different countries were also considered in the study, with an emphasis on the PPP projects in China, India and the Philippines. Substantial government support was observed for the three countries, with the greatest variation observed for the PPP projects in India. Other than how PPP projects are configured in these countries, the archival review serves as a market test of how PPPs operate and thrive in each of these countries, how these projects are structured and how incentives are available ex ante.

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Appendix: Database of 104 Asian PPP projects

	Project Title	Country	Sector	PPP Variant	Investment Year	Project Sponsors (Owners)	Project Cost
1	Baku-Tbilisi-Ceyhan Pipeline	Azerbaijan, Georgia, Turkey	Energy	20-year BOT	2003	BP Corporation of North America (30.10%), SOCAR of (25%/ Azerbaijan), Unocal (8.9%/ United States), Statoil (8.71%/ Norway), Turkish Petroleum AO (6.53%/ Turkey), ENI(5%/ Italian), TOTAL (5%/ France), ITOCHU (3.4%/ Japan), Conoco Phillips (2.5%/ United States), INPEX (2.5%/ Japan) and Amerada Hess (2.36%/ United States)	US$3.637B
2	Meghnaghat Power Project	Bangladesh	Energy	BOO	1997	Globeleq Bangladesh ltd	$300M
3	Tala Hydroelectric Project	Bhutan	Energy	30-year BOT	2007	Bharat Heavy Electrical Ltd (India), Hindustan Construction Company (India), Larsen and Toubro (India) and Jaiprakash Industries (India)	US$1.088B
4	Green Power Development Project	Bhutan	Energy	Joint Venture (JV), 25-year Power Purchase Agreement (PPA) for Dagachhu development	2009	Druk Green Power Corporation (DGPC), Tata Power Company (TPC) for the Dagachhu hydropower development (1st component), Bhutan Power Corporation (BPC) for the electrification component	US$234.45M, comprising $201.47M for Dagachhu development, and $32.98M for renewable energy access for the poor
5	CPTL Power Transmission Project	Cambodia	Energy	30-year BOT	2005	A. S. K. Co. Ltd. (40%), SKL Group Holding Ltd. (25%), and two individual investors	US$32M
6	Shajiao B Power Station	China	Energy	10-year BOT (Equity Joint Venture between Hopwell Power China Ltd and Shenzhen Special Economic Zone Power Development Co.)	1987	Hopewell Power (China) Ltd (HPC), Shenzhen Special Economic Zone Power Development Co. (SPDC)	US$512M
7	Laibin B Power Project	China	Energy	BOT	1997	Electricite de France International (EDFI) (85%) and GEC Alstom (15%)	US$616M
8	Zhangbei Wind Power Project	China	Energy	25-year BOO		China Energy Conservation Investment Corporation (CECIC) (70%); HKC (Holding), Ltd. (30%)	US$35M
9	Powerlinks Project	India	Energy	30-year BOT	2004	Tata Power Company (51%), Power Grid Corporation of India (49%)	US$265M
10	Bhiwandi Electricity Distribution Franchisee	India	Energy	10-year Distribution Franchisee Agreement (DFA)	2006	Torrent Power AEC Limited (TPAL)	US$22M

	Project Title	Country	Sector	PPP Variant	Investment Year	Project Sponsors (Owners)	Project Cost
11	Dahej LNG Terminal Project	India	Energy	30-year BOT	2011	Bharat Petroleum Corp. Ltd (BPCL), GAIL (India) Ltd., Indian Oil Corp. Ltd (IOL), & Oil and Natural Gas Corp. Ltd (ONGCL)-50%, Gaz de France International (GDFI)-10%, ADB-5.2%, public-34.8%	US$1251.7M
12	Gunung Salak Geothermal Power Plant	Indonesia	Energy	15-year BOT	1996	Chevron (50% / United States), PT Nusamba Geothermal (50% / Indonesia)	US$434M
13	Darajat Geothermal Power Plant	Indonesia	Energy	40-year BOT	2004	Chevron (95% / United States)	US$128M
14	Paiton III Thermal Power Plant	Indonesia	Energy	30-year BOO	2010	International Power (wholly-owned subsidiary of GDF Suez) (40.5%/ France), Mitsui (40.5%/ Japan), Tokyo Electric Power (TEPCO) (14%/ Japan), and PT Batu Hitam Perkasa (BHP) (5%/ Indonesia).	US$1.519B
15	Cirebon Coal-Fired Power Plant	Indonesia	Energy	BOT	2010	Marubeni Corp. (33% / Japan), PT Tripatra (20% / Indonesia), Samtan (20% / Korea, Rep.), Korea Midland Power Corporation (KOMICO) (28% / Korea, Rep.)	US$850M
16	Central Java Coal Fired Power Plant	Indonesia	Energy	25-year BOT	2011	J-Power (34%/ Japan), Itochu Corporation (32%/ Japan) and Adaro Power (34%/ Indonesia)	US$4B
17	Amman East Power Project	Jordan	Energy	25-year BOO	2007	Mitsui (40% / Japan), AES Corporation (60% / United States)	US$300M
18	Theun Hinboun Hydropower Project	Laos	Energy	30-year BOT	1996	Electricite du Laos (60%), GMS Lao Company Limited (MDXL) (20%/ Thailand), Statkfraft SF(20%/ Norway)	US$240M
19	Nam Theun 2 Hydroelectric Project	Laos	Energy	31-year BOT	2005	Electricite de France International (40%/ France), Electricity Generating Public Company (EGCO) (35%/ Thailand), Lao Holding State Enterprise (25%/ Laos)	US$1.2B

	Project Title	Country	Sector	PPP Variant	Investment Year	Project Sponsors (Owners)	Project Cost
20	Hongsa Coal-fired Power Plant	Laos	Energy	25-year power purchase agreement (PPA) under BOT	2010	Ratchaburi Electricity Generating Holding PCL (40%/ Thailand), Banpu Power Co., Ltd (40%/ Thailand), and Lao Holding State Enterprise (20%/ Laos)	US$3.71B
21	Tanjung Bin Power Plant	Malaysia	Energy	25-year BOO	2003	Malakoff Corporation Berhad (90%); Malaysia's Employees Provided Fund (10%)	US$2B
22	Yetagun Gas Pipeline	Myanmar	Energy	30-year BOO	1997	Petroliam Nasional Berhad (PETRONAS) (41% / Malaysia), PTT Public Company Ltd. (20% / Thailand), Nippon Oil Corporation (NOC Group) (20% / Japan)	US$800M
23	New Bong Escape Hydropower Project	Pakistan	Energy	25-year BOT	2009	Hub Power Company Limited (HUBCO) (75%/ Pakistan), Coate and Co Ltd (16.67%/ Pakistan), Ashgar Ali Sons and Co (7.78%/ Bahrain)	US$233M
24	Patrind Hydropower project	Pakistan	Energy	30-year BOT	2011	Korean Water Resources Corporation (wholly owned by Government of Republic of Korea) 80%; Daewoo Engineering and Construction Company Ltd.; Sambu Construction Company Ltd	$409 M
25	Pagbilao Coal-Fired Plant	Philippines	Energy	25 year BOT	1991	Tokyo Electric Power Company (TEPCO) (50%/ Japan) Marubeni Corporation (50%/ Japan)	US $ 888M
26	Sual Power Plant	Philippines	Energy	25 year BOT	1995	Tokyo Electric Power Company (TEPCO) (50%/ Japan) Marubeni Corporation (50%/ Japan)	US $ 1352M
27	Bakun River Power Plant	Philippines	Energy	25-year BOT	2004	Aboitiz Equity Ventures (100%/ Philippines)	US$150M
28	Pamir Private Power Project	Tajikistan	Energy	25-year BROT	2002	International Finance Corporation (IFC), Aga Khan Fund for Economic Development (AKFED)	US$26M
29	Changwat Lopburi Power Project	Thailand	Energy	BOO	2010	Mitsubishi (33.33% / Japan), China Light and Power Ltd. (33.33% / Hong Kong, China), Electricity Generating Company (EGCO) (33.33% / Thailand)	$245.6M

	Project Title	Country	Sector	PPP Variant	Investment Year	Project Sponsors (Owners)	Project Cost
30	Nong Saeng Natural Gas Power Project	Thailand	Energy	25-year power purchase agreement (PPA) under Independent Power Producers (IPP) program	2011	Gulf JP N.S. Co. Ltd (Thai subsidiary of J-Power)	US$1.6B
31	Phu My 3 Gas-fired Combined-Cycle Power Plant	Vietnam	Energy	20-year BOT	2003	BP Plc (UK; 1/3), SembCorp Utilities (Singapore; 1/3), Kyushu Electric Power Company (Japan), Sojitz Corp (Japan)	US$385.9M
32	O Mon IV Combined Cycle Power Plant	Vietnam	Energy	No information available	2011	Electricity of Vietnam (EVN)	US$793.45M
33	National Stadium BOT Project for Beijing 2008 Olympic Games	China	Infrastructure	32-year BOT	2003	China International Trust and Investment Corporation (CITIC) (65%/ China), Beijing Urban Construction Group Corp (30%/ China), Golden State Holding Group Corp(U.S.) (5%)	US$653M
34	Mandaluyong City Public Market	Philippines	Infrastructure	40-year BOT	1991	Several Private Partners forming Macro Funders and Developers, Inc. (the project concessionaire)	US$10M
35	Singapore Sports Hub PPP Project	Singapore	Social Infrastructure	25-year Concession Agreement	2010	HSBC Infrastructure Fund Management Ltd (82%), Dragages Singapore Ltd (part of Bouygues Corp-France)(11%), United PREMAS Ltd (part of UGL Ltd-Australia)(5%) Golden Spectrum Pte Ltd (2%/ USA)	US$1.3B
36	Timarpur Okhla Integrated Municipal Solid Waste Management Project	India	Solid Waste	25-year BOT	2008	Jindal Urban Infrastructure Limited (JUIL) (100%/ India)	US$53M
37	Maldives' Solid Waste Project	Maldives	Solid Waste/Energy	20-year BOT	2009	UPL Environmental Engineers Limited, Mittledeutsche Sanierunds-Und Entsorgungs Gesellschaft mBH	US$1M
38	Cochin International Airport	India	Transportation (Airports)	BOO	1994	Government of Kerala-33.36%; Indian government companies (such as Air India, Bharat Petroleum Corporation Ltd) 8.74%; Nationalized and other banks 5.91%; Foreign holdings 5.42%; Others-38.03%	US$125M

	Project Title	Country	Sector	PPP Variant	Investment Year	Project Sponsors (Owners)	Project Cost
39	Malé International Airport	Maldives	Transportation (Airports)	25-year RLT	2010	GMR Infrastructure Ltd (India), Malaysia Airport Holdings Berhad (MAHB)	US$400M
40	Hajj Airport Terminal	Saudi Arabia	Transportation (Airports)	20-year BTO	2006	Saudi Binladin Group in association with Aeroports de Paris Management	US$315M
41	Citong Bridge Project	China	Transportation (Bridge)	30-year BOT	2003	Mingliu Corporation	US$30M
42	Penang Bridge	Malaysia	Transportation (Bridge)	25 year Lease Contract	1993	Several Private Sector Partners	US$330M
43	Yen Lenh Bridge Project	Vietnam	Transportation (Bridge)	17 year BOT	2003	Civil Engineering Construction Corporation No. 4 (CIENCO No.4), Thang Long Construction Corporation	US$21.5M
44	Nhava Sheva International Container Terminal	India	Transportation (Ports)	30-year BOT, license based on highest NPV royalty offered	1997	P&O Australia Ports Pty Ltd, Konsortium Perkapalan Berhad, DBC Group of Companies	US$183.3M
45	Kakinada Deep Water Port	India	Transportation (Ports)	20-year OMST / BOMST with an extension of 10 years	1999	International Seaports Pte Ltd (ISPL), Salgaocar Mining Industries Pvt. Ltd. (SMIPL)	US$ 154.4M (US$72M for the 3 berths, US$82.5M for the development of the fourth berth)
46	Gangavaram Port	India	Transportation (Ports)	30-year BOT	2005	Mr. Raju and Associates (51%/ India), Warburg Pincus (28%/ USA), Andhra Pradesh Infrastructure Investment Company (APIIC) (11%/ India)	US$385.5M
47	Aqaba Port Expansion	Jordan	Transportation (Ports)	25-year BROT	2006	APM Terminals (51%), Aqaba Development Corporation (49%/ wholly-owned by Government of Jordan)	US$710M
48	Port Klang	Malaysia	Transportation (Ports)	21-year lease agreement	2007	Konas Terminal Kelang SDN. BHD. (KTK) (51%) composed of Kontena Nasional SDN Berhad (80%) and P&O Australia (20%); Port Klang Authority (49%)	US$151M
49	Colombo Port Expansion	Sri Lanka	Transportation (Ports)	30-year BOT	1999	Sri Lanka Port Authority (15%), Sri Lanka private investment group (26.25%), foreign port management companies (26.25%), ADB, IFC, CDC (7.5% each), a foreign shipping company (10%)	US$240M

	Project Title	Country	Sector	PPP Variant	Investment Year	Project Sponsors (Owners)	Project Cost
50	Cai Lan International Container	Vietnam	Transportation (Ports)	No information available	No information available	Cai Lan Port Investment Joint Stock Company (CPI) (owned by Vinalines which is the Vietnam's national shipping line) (51%/ Vietnam), SSA Holdings International-Vietnam, Inc (subsidiary of Carrix, Inc.) (49%/ USA)	US$155M
51	Hassan-Mangalore Railway Project	India	Transportation (Railways)	32-year BOT	2004	Ministry of Railways (MOR)40.95%, Government of Karnataka 40.95%, Karnataka-Rail Infrastructure Development Ltd (K-RIDE) 16.36%, Others (e.g.New Mangalore Port Trust) 1.82%	US$72.75M
52	Hyderabad Metro	India	Transportation (Railways)	35-year BOT, including construction of 5 years	2011	Maytas Infrastructure (26%), Nav Bharat Ventures (16%), Government of Andhra Pradesh (11%) IL&FS and Ital-Thai holding 5% each, Remaining 37% owned by Maytas Metro Limited (project SPV) which it proposed to sell to include more partners	US$3.315B
53	Mumbai Metro	India	Transportation (Railways)	35-year BOT	2011	Reliance Energy Ltd (69%/ India), Veolia Transport (5%/ France), Mumbai Metropolitan Region Development Authority (MMRDA) (26%)	US$589M
54	Shar-Oskemen Station	Kazakhstan	Transportation (Railways)	25-year BOT	2005	Kazakhstan Investment Fund (a public fund), Kazakhstan Temir Zholy	US$250M
55	MRT 3 Project	Philippines	Transportation (Railways)	25-year BLT	1999	MRT Holdings, Inc. (84.9%); Fil-Estate Properties Inc. (8.7%), Fil-Estate Corp. (4%), Railway Systems Holdings Co. Inc. (1.4%), and Rapid Urban Transit Holdings Inc. (1%)	US$655M
56	Taiwan High Speed Rail	Taiwan	Transportation (Railways)	35-year BOT	1998	Taiwan High Speed Rail Alliance	US$18.4B
57	Bangkok Rapid Transit System	Thailand	Transportation (Railways)	30-year BOT	1995	local partners	US$1.3-2B
58	Dhaka-Chittagong Highway Expansion Project	Bangladesh	Transportation (Road)	30-year BOT	No information available	Project contractors: Sinohydro Corporation (China) , Reza Construction (Bangladesh), TBL-ACL joint venture(Bangladesh)	$336.5M
59	Xiang-Jing Expressway	China	Transportation (Road)	35-year BOT	2001	Gezhouba Corporation(55%), Hubei Road Construction Company (20%), Jingzhou Investment Company (10%), Hubei Investment Company (9%) and Xiangfan Road Construction Co. Ltd (6%)	US$541M

	Project Title	Country	Sector	PPP Variant	Investment Year	Project Sponsors (Owners)	Project Cost
60	Vadodara Halol Toll Road	India	Transportation (Road)	30-year BOT	2000	Government of Gujarat (GoG) and Infrastructure Leasing and Financial Services (IL&FS)	US$35.5M
61	Tuni Anakapalli Annuity Road Project	India	Transportation (Road)	17.5 year BOT	2002	GMR Group (74%/ India), United Engineers Malaysia (UEM) Berhad Group (26%/ Malaysia)	US$152.2M
62	Delhi Gurgaon Expressway	India	Transportation (Road)	20-year BOT	2003	Jaiprakash Industries Ltd (51%/ India), DS Construction Ltd (49%/ India)	US$293.8M
63	Tamil Nadu East Coast Road	India	Transportation (Road)	50:50 Joint Venture, ROT	2006	Infrastructure Leasing and Financial Services Ltd (IL&FS) and 2 French Companies	US$225M
64	Cipularang Tollway Project	Indonesia	Transportation (Road)	BOT	2005	PT Jasa Marga (Indonesia)	US$183.5M
65	Cross-Israel Highway Project	Israel	Transportation (Road)	30-year BOT	1999	Derech Eretz Highways (DEC) (Israel)	US$1.3B
66	Metro Manila Skyway (Stage 1)	Philippines	Transportation (Road)	Joint Venture (BOT)	1995	CT Citra Group (Indonesia) and Philippine National Construction Corporation (PNCC)	US$535.89M
67	North Luzon Expressway	Philippines	Transportation (Road)	30-year BROT	2005	Metro Pacific Investment Corporation (67.1%/ Philippines), Leighton Asia Ltd. (16.5%/ Australia), Egis SA (13.9%/ France), Philippince National Construction Corporation (PNCC) (2.5%)	US$384M
68	SLEX Extension Project	Philippines	Transportation (Road)	30 year BROT	2006	Philippine National Construction Corp (20%); MTD Manila Expressways Inc (Malaysia) (80%)	US$285M
69	Tarlac-Pangasinan- La Union Expressway	Philippines	Transportation (Road)	35 year BTO	2010	D.M. Consunji Inc.(34%), First Balfour Inc. (34%), EEI Corp., C.M. Pancho Construction, R.D. Policarpio & Co. Inc., D.M. Wenceslao & Associates, J.V. Angeles Construction, J.E. Manalo & Co. Inc., New Kanlaon Construction Inc. and Rockford Development	US$422M
70	Daejeon Riverside Expressway	South Korea	Transportation (Road)	BTO	2000	Egis Project of France, Singapore Pilling & Civil Engineering, Doosan Construction and Engineering	US$130M
71	Seoul Beltway Project	South Korea	Transportation (Road)	30-year BTO	2003	LG Engineering and Construction Co(27%), Kumho Construction Co(14%), Daelim Industrial Co (12%), Daewoo Engineering & Construction Co (10%), Doosan Construction & Engineering Co (8%), Kolon Engineering & Construction Co (8%), Hyundai Engineering & Construction Co (8%), Lotte Construction Co (8%) and Samwhan Corp (5%)	US$1.815B

	Project Title	Country	Sector	PPP Variant	Investment Year	Project Sponsors (Owners)	Project Cost
72	Beijing Fourth Subway Line Project	China	Transportation (Subways)	30-year BOT	2006	Mass Transit Railway Corporation (MTR) (49%), Beijing Capital Group (BCG) (49%), Beijing Infrastructure Investment Corporation (BIIC) (2%)	US$577M
73	Amritsar Intercity Bus Terminal Project	India	Transportation (Terminal)	11.5- year BOT	2004	Rohan Builders (India) Pvt Ltd., Rajdeep Buildcon Pvt Ltd, and Rajdeep Road Developers Pvt. Ltd	US$6M
74	Yan'an Donglu Second Tunnel Project	China	Transportation (Tunnels)	30-year BOT	1993	Hong Kong Jingli Company Ltd. (HKJC), guaranteed by China International Trust and Investment Co. (CITIC), Shanghai Huangpujiang Tunnel Company (SHTC), guaranteed by Shanghai Urban Construction Investment Development Co. (SUCIDC)	US$217M
75	Yerevan Water and Sewerage Lease Contract	Armenia	Water	Lease Contract	2005	Veolia Environnement (France)	initial costs of US$28.91M
76	Muharraq Wastewater Treatment Plant	Bahrain	Water	27-year BOO	2011	Samsung Engineering(45%/ South Korea), Invest AD(35%/ U.A.E.), United Utilities(20%/ U.K.)	US$300M
77	Provincial and Peri-Urban Water Supply and Sanitation Project	Cambodia	Water	15-year DBL	No information available	Several Private Bidders under ICB Tender provisions, World Bank	US$23.27M
78	Macau Water Supply Concession	China	Water	25-year RLT	1985	JV company Sino-French Holdings Ltd (85%), comprising Lyonnaise des EauxNew World (China), 15% remains with the old water company, Macau Water Supply Company	US$25M
79	Chengdu No. 6 Water Plant Project	China	Water	18-year BOT	1999	Chengdu Generale Dex Eaux-Marubeni Waterworks (CGEM) (40%), Veolia France (60%)	US$107.6M
80	Shanghai Zhuyuan Youlian No. 1 Wastewater Treatment Project	China	Water	20-year BOT	2005	Youlian Development Company (45%), Huajin Information Investment Ltd. Company (40%), and Shanghai Urban Construction Group (15%)	US$30M
81	Salt Lake Water Supply and Sewerage Network	India	Water	30-year BOT	2007	Jamshedpur Utilities and Services Company Ltd (JUSCO) and Voltas Ltd (both companies are under Tata enterprises)	US$16.9M
82	Tirupur Water Supply and Sanitation Management	India	Water	30-year BOT	2000	Infrastructure Leasing and Financial Services (IL&FS)	US$220M

	Project Title	Country	Sector	PPP Variant	Investment Year	Project Sponsors (Owners)	Project Cost
83	Alandur Sewerage Project	India	Water	BOT for the sewerage treatment plant; BOQ or Bill of Quantities basis for the underground sewerage system	2001	IVRCL Infrastructures and Projects Ltd, in technical collaboration with Va Tech Wabag Technologies Ltd	US$2.1M
84	Latur Water Supply Project	India	Water	10 year Management Contract	2007	Subhash Projects and Marketing Ltd.,UPL-Environmental Engineers Limited and Hydro Comp Enterprises	US$8.75M
85	Karnataka Urban Water Supply Improvement Project	India	Water	PPP Management Contract for Rehabilitation, Operation and Maintenance	2008	Compagnie Generale des Eaux, Paris, France (now known as Veolia Water)	US$13.79M
86	Jakarta Water (West) Project	Indonesia	Water	25-year BROT	2000	PT Pam Lyonnaise Jaya (part of GDF Suez, a French company)	US$318M
87	PDAM Bekasi Project	Indonesia	Water	25-year BOT	2012	PT Moya Indonesia(95%/ Singapore), PT Bekasi Putera Jaya (5%/ owned by the local government)	US$15-20M
88	Greater Beirut Water Supply Project (GBWSP)	Lebanon	Water	DBO	2010	Beirut Mount Lebanon Water Establishment (BMLWE), Government of Lebanon (GoL)	US$370M
89	Johor Water Company	Malaysia	Water	BROT	1992	Kembangan Dinamik (49%), Pilecon Engineering Board and Lyonnaise des Eaux (51%)	US$177M
90	Stormwater Management and Road Tunnel Project	Malaysia	Water	40-year BOT	2003	MMC Corp Berhad and Gamuda Berhad	US$510M
91	Melamchi Water Supply Project	Nepal	Water	No information available	2008	Nepal Water Supply Corporation & Water Authority-owners	US$317.3M
92	Casecnan Multipurpose Project	Philippines	Water	20 year BOT	1995	CalEnergy (70%/ U.S.A.); Local partners (LA Prairie Group Contractors and San Lorenzo Ruiz Builders and Developers)= 30%	US $ 495.5M
93	MWSS Privatization Project	Philippines	Water	25-year BROT	1997	Manila Water Company Inc (Manila Water) Maynilad Water Service, Inc (Maynilad)	US$7B
94	Ulu Pandan NEWater DBOO Project	Singapore	Water	20-year DBOO	2004	Keppel Integrated Engineering Limited	US$50-60M
95	Nanzih BOT Wastewater Treatment Project	Taiwan	Water	35-year BOT	2004	Green Forest Development Enterprise (a local private construction and development company)	US$160M
96	West Bangkok Water Project	Thailand	Water	30-year BOO	2001	Ch Karnchang Company Limited (36% / Thailand), Mitsui (26% / Japan)	US$240M

	Project Title	Country	Sector	PPP Variant	Investment Year	Project Sponsors (Owners)	Project Cost
97	Pathum Thani Water Project	Thailand	Water	25-year BOT	2007	Ch Karnchang Company Limited (48% / Thailand), Mitsui (35% / Japan)	US$60M
98	Bukhara & Samarkand Water Supply Project	Uzbekistan	Water	Management and Lease Contract	2004	Stockholm Water Company (Sweden), Amiantit Group (Saudi Arabia)	US$62.33M
99	Thu Duc Water Project	Vietnam	Water	25-year BOO	2001	Vietnamese consortium of six companies (HCM City Infrastructure Investmen Joint Stock Co, HCM City Investment Fund for Urban Development, Construction Corp no. 1, Refrigeration and Electrical Engineering Corp, Water and Environment Joint Stock Co, Thu Duc House Devt Co)	US$154M
100	Vietnam Rural Water (East meets West) Project	Vietnam	Water	No information available	2007	Global Partnership on Output-based Aid (GPOBA)	US$3.81M
101	KAIA Desalination Project	Saudi Arabia	Water (Desalination)	20-year Take-or-Pay Purchase Agreement under BOT	2006	SETE Technical Services S.A. of Greece, Aquatech International Corporation of US, Haji Abdullah Alireza, WTD srl of Italy	US$40M
102	Tuas Desalination Project	Singapore	Water (Desalination)	BOO	2003	Hyflux Ltd (100%)	US$117M
103	Al Hidd Independent Water and Power Project	Bahrain	Water/Energy	20-year BOO		International Power (40%/ U.K.), Suez Tractebel (30%/ Belgium), Sumitomo Corp(30%/ Japan)	US$1.3 billion
104	Al Ghubrah Independent Water and Power Project (IWPP)	Oman	Water/Energy	15-year Power and Water Purchase Agreement		Electricity Holding Company (EHC) as the public sponsors and private sponsors	US$350-400M

Legend:

- BOT: Build-Operate-Transfer
- BOO: Build-Own-Operate
- BROT: Build-Rehabilitate-Operate-Transfer
- RLT: Rehabilitate-Lease-Transfer
- BTO: Build-Transfer-Operate
- OMST: Operate-Maintain-Share-Transfer
- BOMST: Build-Operate-Maintain-Share-Transfer
- BLT: Build-Lease-Transfer
- ROT: Rehabilitate-Operate-Transfer
- DBL: Design-Build-Lease
- DBO: Design-Build-Operate
- DBOO: Design-Build-Own-Operate

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