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Understanding the Different Types of PPP Models for Road Projects in India

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ABSTRACT
India has the second-largest road network in the world, spanning a total of 5.89 million kilometers (kms). This road network transports 64.5% of all goods in the country and 90% of India's total passenger traffic uses road network to commute. National highways constitute only 1.7 per cent of the road network, but carry about 40 per cent of the total road traffic. Road Transport has emerged as the dominant segment in India's transportation sector with a share of 4.7% in India's GDP in 2009-10. The number of vehicles on Indian roads has been growing at an average pace of 10.16% per annum over the last five years. Hence, development of road network assumes paramount importance in the context of a rapidly growing economy.
Owing to constraints of public funding, Public Private Partnership (PPP) has come to play a major role in the development of national highways. The National Highways Act, 1956 was amended in 1995 with a view to enabling private investment in development, maintenance and operation of highways. The Government initiated several other measures in this direction such as declaration of road sector as industry to facilitate borrowing on easy terms and reduction in the custom duties on construction equipment. This paper focuses on the concept and current status of PPP in India and study of various PPP models.

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I. INTRODUCTION

Physical infrastructure, such as roads, water and sanitation networks, and transportation systems, involve large investments that can put a strain on the public purse. This strain is especially great for countries, such as India, whose economies are undergoing rapid development and urbanization and have a great need for expanded infrastructure.

Public-private partnerships (PPPs) are increasingly being used by governments and public sector authorities throughout the world as a way of increasing access to infrastructure services for their citizenry and economies at a reduced cost.

The objectives of a PPP in infrastructure are to:

- Increase the availability of infrastructure services
- To do so with greater efficiency (lower cost for the level of services provided) than could be achieved using the traditional public sector approach

PPPs make this possible because:

- PPPs allow access to the substantial financial resources of the private sector
- PPPs enable the public sector to benefit from private sector technical expertise, experience and efficiency
- PPPs enable the public sector to transfer project-related risks to the private sector

A PPP typically has the following characteristics:

- The private sector is responsible for carrying out or operating the project and takes on a substantial portion of the associated project risks
- During the operational life of the project the public sector's role is to monitor the performance of the private partner and enforce the terms of the contract
- The private sector's costs may be recovered in whole or in part from charges related to the use of the services provided by the project, and may be recovered through payments from the public sector
- Public sector payments are based on performance standards set out in the contract
- Often the private sector will contribute the majority of the project's capital costs, although this is not always the case

It will often be necessary to build or add to existing assets in order to meet the infrastructure needs of the economy and users. However, an important part of the infrastructure PPP concept is that:

- A PPP is focused on outputs, and
- The outputs of the PPP are infrastructure *services*, not infrastructure *assets*.

The reason for the focus on outputs and services rather than assets is to encourage efficient use of public resources and improved infrastructure quality.

A PPP brings the public and private sectors together as partners in a contractual agreement, for a pre-defined period (eg. 30 years) matched to the life of the infrastructure assets used to provide the services. The private partners (investors, contractors and operators) provide specified infrastructure services and, in return, the public sector either pays for those services or grants the private partner the right to generate revenue from the project. For example, the private partner may be allowed to charge user fees or receive revenue from other aspects of the project.

The best PPPs will have the public and private partners working together to build and sustain a long-term relationship that is of benefit to all.

II. OBJECTIVE AND PROBLEM STATEMENT

Objectives

Objectives of PPP in Road Projects

Governments pursue PPP programs for different reasons. Some countries begin using PPPs to resolve a crisis or remove bottlenecks in a particular sector. For example, PPPs were first used in South Africa in the roads sector to build more highways. In the Philippines, many of the first PPPs were in the power sector, where the state-owned power company contracted with independent power producers to solve a power crisis. In both cases, the use of PPPs subsequently extended into other sectors.

Most governments define broad PPP program objectives when formulating and documenting their PPP policies. The choice and relative priority of these objectives cascade from the government's other policies and priorities. They can include:

Enabling more investment in infrastructure, by accessing private finance

Encouraging a whole-life-cost approach to infrastructure

Putting a greater focus on the quality of service to the end-user

Accessing additional management capacity through private operation of infrastructure

Achieving value for money in the provision of infrastructure and public services

Improving accountability in the provision of infrastructure and public services

Harnessing private sector innovation and efficiency

Stimulating growth and development in the country

Problem Statement

There is a well-established need for infrastructure investments in India. In recent years India's economy has experienced a period of rapid economic growth, following steps toward economic liberalization made in 1991. In the Tenth Five Year Plan period (between 2002-03 and 2006-07), the average growth rate in India was 7.6 percent in comparison to 5.5 percent achieved in the Ninth Plan period of 1997-98 and 2001-02. The estimates in the Eleventh Five Year Plan's (2007-2012) were for even higher growth at 9 percent.

This level of growth necessitates rapid improvements and additions to the capacity of economic infrastructure. However, the ability of infrastructure to keep up with the economy's fast expansion has been constrained by the availability of investment. It was estimated that investment in infrastructure of up to 5% of GDP would be required by 1999. However, the actual investment by 1999 was only 3.7% of GDP, with private investment contributing just 0.9% of GDP 4 .

Realizing that the share of private investment needed to increase manifold, the Government of India initiated a strategy for encouraging private investment in infrastructure through Public Private Partnerships (PPP). The Government of India envisaged that the investment in infrastructure would increase to 8% of GDP by 2011-12 and that of this the investment from private sources would contribute approximately 1.2% of GDP.

III. Literature Review

A large body of existing literature, based primarily on principal-agent (Marschak,1955; Arrow,1963; Pauly, 1968) and incomplete contract theory (Hart, 2003), focuses on the balance between the allocation of risks and rewards of public and private sectors for successful execution of PPP projects (Grimsey and Lewis, 2002; Dixon, Pottinger, & Jordan, 2005; Liu, Love, Davis, Smith, & Regan, 2015; Xu et al., 2010; Zhang et al., 2015; Zhang, 2005). Literatures also recognize that there exist numerous challenges in traditional PPP contracting such as crowding out of reputed developers, aggressive bidding due to irrational exuberance, default in financial closure, and arbitrations and litigations (EY, 2015). However, what the literature has not tackled is how to

systematically identify risks of various variants within PPP for a particular sector and compare against each other. In India, to the best of the authors' knowledge, only one study by Singh and Kalidindi (2006) investigates how one variants of PPP i.e. Annuity-based BOT model could be a better option to manage the traffic revenue risk and promote private sector participation as compared to pure BOT concessions highway projects in India. When it comes to global practices towards PPP, the private finance initiative (PFI) of the UK is perhaps the best developed government's PPP programme, while experience with variants of PPP model have been adopted in many countries, such as the Least Present value of Revenue (LPVR) in Chile and occasionally in Spain, Hybrid PPPs (i.e. Toll along with Annuity; Grant along with Annuity; Grant coupled with Toll and Annuity) in Greece, Output & Performance Based Road Contracts (OPRC) in UK, USA, Australia, Norway, Finland, Sweden, Netherlands, Pilot projects in India by World Bank, Swiss

challenge in a number of countries including India; a single, relatively short contract with rebidding clause in Argentina (EY, 2015; Gomez-Ibanez 2003; Lakshmanan (RBI), 2008; for a cross-country comparison of key drivers, critical success factors, and risk allocation in PPPs, see Chou and Pramudawardhani (2015)). Government of India's increased PPP impetus along with experimenting with new PPP variants in the highway sector has become an important phenomenon in recent years, yet it has received scant attention in the literature. This is a gap this research seeks to fill.

IV. Salient Features of PPP

Typical PPP features

- long term contractual relationships between public and private sectors (contracts terms from 3 to 25 years);
- under the partnerships contract a single private body is responsible to engage not in one type but in complex activity (i.e. to carry out infrastructure objects designing, construction, renovation, repair and maintenance of the assets);
- PPP approach can bring value for money in public services delivery;
- project-related risks are shared among partners and allocated to the party best able to manage it;
- public sector payments to private partner only commence when the asset required is first available for use to deliver services;
- ownership right of the assets, transferred to a private body enabling him to use and manage them in delivering services, remains with public sector.

V. ANALYSIS OF PPP PROJECTS

SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis of PPP Projects

Strengths of PPP projects

Access to private sector finance

India has a very large infrastructure need and an associated funding gap. PPPs can help both to meet the need and to fill the funding gap. PPP projects often involve the private sector arranging and providing finance. This frees the public sector from the need to meet financing requirements from its own revenues (taxes) or through borrowing. This is an advantage where the public sector is facing limits on how much capital it can raise, as in India. By shifting the responsibility for finance away from the public sector PPPs can enable more investment in infrastructure and increased access to infrastructure services.

Using private sector finance also allows the public sector to move large capital expenditure programmes 'off balance sheet'. This has been a motivating factor for PPPs in countries where the constraint on finance is a government commitment to

a borrowing (ie. public debt) cap.

Note however that the issue of the appropriate accounting treatment for the long-term commitments associated with PPPs has generated a lot of discussion in some countries (eg. United Kingdom). There has been a call for the long-term payment stream to be disclosed in government accounts so as to provide an accurate picture of the actual public sector funding position.

Higher efficiency in the private sector

A well designed and managed PPP should take advantage of the potential for efficiency gains from using the private sector.

Increased efficiency is driven by three features of well designed PPPs:

The allocation of risk and the associated performance rewards and penalties create incentives in the PPP contract that encourage the private partner to achieve efficiency at each stage of the project and to introduce efficiency improvements where possible. By shifting risk onto private partners the public sector is able to limit its own exposure to cost escalation.

PPPs can be structured so as to create a **whole-of-life focus** in which the private partner designs the project to take account of the link between construction and operation so that the cost will be minimised over the project's

lifetime. A private partner who in addition to designing and building the project will also provide the ongoing operations and maintenance management has an incentive to ensure that the design and construction facilitate efficient O&M. By contrast, if one set of contractors is employed for design and construction and other unrelated contractors for O&M they will each take a narrow perspective, considering only the point efficiencies in their component and not taking account of the interactions between the two.

Competition is introduced during the bidding stage, thereby bringing the benefits of market procurement (this is a kind of "competition for the market"). As long as the project is well specified in terms of the output requirements (rather than specifying the inputs) then each private sector bidder has an incentive to produce an innovative response and to minimize cost.

Increased transparency in the use of funds

The key to increased transparency and reducing opportunities for corrupt practices is the release of information to the public domain, for use in the media and by interested and concerned individuals, NGOs, and the private sector participants themselves.

A well-designed PPP process can bring procurement out from behind closed doors. The PPP tender and award process should be based on open competitive bidding following international best practice procedures.

A PPP policy framework usually includes the creation of an oversight agency such as the PPP Cells already created at the Centre and in many States in India. These agencies often have an MIS role and can help improve the transparency of PPP procurement.

Weaknesses of PPP Projects

A PPP is not a panacea for all the public sector's funding and infrastructure problems and PPPs are not always the most appropriate procurement option. The following are noted complexities in PPPs. Most of these can be minimised under certain circumstances and through careful management of the PPP design by the Sponsoring Authority. This requires public sector capacity (experience and expertise) to manage the PPP process.

Complex procurement process with associated high transaction costs

The PPP project must be clearly specified, including allocation of risk and clear statement of the service output requirements. The long-term nature of PPP contracts requires greater consideration and specification of contingencies in advance.

The tendering and negotiation process is a costly exercise. Transactions advisors and legal experts will typically be required.

Contract uncertainties

PPPs often cover a long-term period of service provision (eg. 15-30 years, or life of the asset). Any agreement covering such a long period into the future is naturally subject to uncertainty. If the requirements of the public sponsor or the conditions facing the private sector change during the lifetime of the PPP the contract may need to be modified to reflect the changes. This can entail large costs to the public sector and the benefit of competitive tendering to determine these costs is usually not available.

This issue can be mitigated by selecting relatively stable projects as PPPs and by specifying in the original contract terms how future contract variations will be handled and priced.

See the National Audit Office report on making operational changes to PFI contracts in the UK for examples of the types of changes experienced in PPPs there and for suggestions on how changes can be implemented cost-effectively and quickly.

The Suitability Filter, which is one of the tools included with this toolkit, includes a question on how easily measurable and definable the project outputs are. Projects with precisely measured and defined outputs are less likely to run into contract disputes.

Enforcement and monitoring

Once it enters the construction and operation phases, the success of the PPP from the public perspective will depend on the ability of the sponsor to monitor performance against standards and to enforce the terms of the contract.

Difficulty in demonstrating value for money in advance

Ideally, a project should be procured as a PPP on the basis of a clear demonstration that it provides value for money (VFM) compared with public sector procurement. However, it is difficult to demonstrate VFM in advance due to uncertainties in predicting what will happen over the life of the project and due to a lack of information about comparable previous projects.

However, the standard for VFM is different in India to more economically developed countries such as Australia or the UK. In those countries there is a much smaller funding need. In India, many projects procured in the public sector, experience time and cost overruns, and hence it is likely that well-managed private procurements will deliver savings. Furthermore, the funding gap is far greater than the Public Sponsor can meet by itself. In

this case, it may sometimes not be a question of public vs. private procurement, but rather the choice between private procurement or none at all. If this is the case then the focus should be on making a careful assessment of alternative project options to be sure that the projects that are selected are the best ones economically and financially.

Major Risks in PPP Projects

Not all projects in the roads sector will have the same set of risks and the risks that are common will vary in importance from one project to another. However, it is possible to identify a set of risks that generally apply to projects in the sector.

Typical risks in Infrastructure PPP projects

Pre-Operative Task Risks

- Delays in land acquisition- Refers to the risk that the project site (or sites) will be unavailable or unable to be used within the required time, or in the manner or the cost anticipated or the site will generate unanticipated liabilities due to existing encumbrances and native claims being made on the site.

- External linkages-Refers to the risk that adequate and timely connectivity to the project site is not available, which may impact the commencement of construction and overall pace of development of the project.

- Financing risks-Refers to the risk that sufficient finance will not be available for the project at reasonable cost (eg, because of changes in market conditions or credit availability) resulting in delays in the financial closure for a project.

- Planning risks-Refers to the risk that the pre-development studies (technical, legal, financial and others) conducted are inadequate or not robust enough resulting in possible deviations from the outcomes that were planned or expected in the PPP project development.

Construction Phase Risks

- Design risk-Refers to the risk that the proposed design will be unable to meet the performance and service requirements in the output specification. It can result in additional costs for modification and redesign.

- Construction risk- Refers to the risk that the construction of the assets required for the project will not be completed on time, on budget or to specification. It may lead to additional raw materials and labor costs, additional financing costs, increase in the cost of maintaining existing infrastructure or providing a temporary alternative solution due to a delay in the provision of the service.

- Approvals risk-Refers to the risk that delays in approvals to be obtained during the construction phase will result in
- a delay in the construction of the assets as per the construction schedule. Such delays in obtaining approvals may lead to cost overruns.

Operation Phase Risks

- Operations and maintenance risk-Refers to the risks associated with the need for increased maintenance of the assets over the term of the project to meet performance requirements.

- Traffic risk-Refers to the risk that fees for services are not collected in full or are not set at a level that allows recovery of costs.

- Financial risk-Refers to the risk that the concessionaire introduces too much financial stress on a project by using an inappropriate financial structure. It can result in additional funding costs for increased margins or unexpected refinancing costs.

- Non-operations revenue risk-Refers to the revenue risk related to real estate or other similar business operations that are associated with the project. This risk is only relevant to Lease Develop Operate type PPPs, in which real estate development are often an important revenue source for the project.

Different Models of PPP Projects

Build – Operate – Transfer (BOT)
A BOT model is generally used to develop a discrete asset rather than a whole network, for example a toll road. This simple structure provides the most freedom for the private sector partner during construction and the public sector bears the equity risk.
Build – Own – Operate (BOO)
This is a similar structure to BOOT (below), but the facility is not transferred to the public sector partner. A BOO transaction may qualify for tax exempt status and is often used for water treatment or power plants.
Build – Own – Operate – Transfer (BOOT)
The private sector builds and owns the facility for the duration of the contract, with the primary goal of recouping construction costs (and more) during the operational phase. At the end of the contract the facility is handed back to the government. This structure is suitable when the government has a large infrastructure financing gap as the equity and commercial risk stays with the private sector for the length of the contract. This model is often used for school and hospital contracts.
Design – Build
The contract is awarded to a private partner to both design and build a facility or a piece of infrastructure that delivers the performance specification in the PPP contract. This type of partnership can reduce time, save money, provide stronger guarantees (as the work is with a single entity rather than a consortium) and allocate additional project risk to the private sector
Design – Build – Finance
The private sector constructs an asset and finances the capital cost during the construction period only.
Design – Build – Finance – Operate (DBFO)
The private sector designs, builds, finances, operates an asset, then leases it back to the government, typically over a 25 – 30 year period. Public sector long-term risk is reduced and the regular payments make it an attractive option to the private sector.
Design – Construct – Maintain – Finance (DCMF)
Design, Construct, Maintain and Finance is very similar to DBFM. The private entity creates the facility based on specifications from the government body and leases it back to them. This is generally the convention for PPP prison projects.
HAM - Hybrid Annuity Model
Hybrid Annuity Model is a **mix of the EPC and BOT models**. The government will contribute to 40% of the project cost in the first five years through annual payments (annuity). The balance 60 per cent is arranged by the developer, and is recovered as variable annuity amount after the completion of the project from NHAI which collects revenue.

VI. CONCLUSION

The roads and highways plays a key role in development of the country. The Indian government has taken various steps to enhance the condition of the National Highways network. The government of India assented PPP for the development of road network. BOT (Toll), BOT (Annuity) and HAM are the three PPP models that have been used in completing the National Highway projects in India. The selection of the type of PPP models depends on the risk profile and financial viability of the project.

REFERENCES

[1]. Public private partnerships, India Database, Department of economic Affairs, Ministry of Finance, Government of India.
[2]. Arndt, R. H., 2000. Getting a fair deal: efficient risk allocation in the private provision of infrastructure, Doctoral dissertation, University of Melbourne, Australia.
[3]. Arrow, K. 1963. Uncertainty and the welfare economics of medical care. American Economic Review, 53, 941–73.
[4]. Chou, J., and Pramudawardhani, D., 2015. Cross-country comparisons of key drivers, critical success factors and risk allocation for public private partnership projects, International Journal of Project Management, 33(5), 1136–1150.
[5]. Dey, S., 2017. Road construction to meet 40km per day target next year: Gadkari , The Week http://www.theweek.in/content/archival/news/india/road-construction-to-meet-40km-per-daytarget- next-year-gadkari.html accessed on July 26, 2017
[6]. DNA, 2017. HAM road projects hit fin closure hurdle, 17 March, http://www.dnaindia.com/money/report-ham-road-projects-hit-fin-closure-hurdle-2355715
[7]. EY Ernst & Young, 2015. New Model of Indian Road PPP Projects, Asia-Pacific Forum on Public-Private Partnerships for Transport Infrastructure Development Garg, S. and Garg, S., 2017. Rethinking Public-private Partnerships: An Unbundling
[8]. Approach, Transportation Research Procedia, 25, 3793-3811.
[9]. Grimsey, D., Lewis, M.K., 2002. Evaluating the risks of public private partnerships for infrastructure projects. International Journal of Project Management 20 (2), 107–118.
[10]. Hart, O., 2003. Incomplete contracts and public ownership: Remarks, and an application to public private partnerships, The Economic Journal, 113(486)

[11]. Hodge, G. A., Greve, C., and Boardman, A. E., 2010. International Handbook on Public-Private Partnerships, Edward Elgar Publishing.
[12]. Jay, J., 2013. Navigating paradox as a mechanism of change and innovation in hybrid organizations, Academy of Management Journal, 56(1), 137-159.
[13]. Kweun, J. Y., Wheeler, P. K., and Gifford, J L., 2017. Evaluating highway public-private partnerships: Evidence from US value for money studies, Transport Policy, accessed on July 26, 2017
[14]. Liu, J., Love, P., Davis, P., Smith, J., & Regan, M. 2015. Conceptual framework for the performance measurement of public-private partnerships. Journal of Infrastructure Systems, 21(1),1–11.
[15]. OECD, 2008. Public-Private Partnerships: In Pursuit of Risk Sharing and Value for Money, OECD, Paris.
[16]. Pratap, K. V., 2015. User Fees and Political and Regulatory Risks in Indian Public–Private Partnerships, Economic & Political Weekly, 50(36), 25.
[17]. Press Information Bureau, 2015. Report of the Committee on Revisiting & Revitalising the PPP Model of Infrastructure Development Chaired by Dr. V.Kelkar Released, Ministry of Finance, Government of India. http://pib.nic.in/newsite/PrintRelease.aspx?relid=133954 ; accessed on July 26, 2017
[18]. Regan, M., Smith, J., & Love, P.E.D., 2017. Financing of public private partnerships: Transactional evidence from Australian toll roads. Case Studies on Transport Policy, 5(2), 267-278.
[19]. Zhang, X.Q., 2005. Critical success factors for public-private partnerships in infrastructure development. Journal of Construction Engineering and Management, 131(1), 3–14.
[20]. Zhang, S. et al., 2015. PPP application in infrastructure development in China: Institutional analysis and implications. International Journal of Project Management, 33, 497-509.