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Reviewing Infrastructure Finance in India

Rahul Deshpande[1], Tushar Jadhav[2]

[1] School of Planning, Real Estate and Infrastructure, NICMAR University Pune, Maharashtra, India
[2] School of Project Management, NICMAR University Pune, Maharashtra, India

Corresponding Author: Rahul Deshpande, rdeshpande@nicmar.ac.in

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ABSTRACT

The Indian government has embarked on an ambitious target of US $ 1.4 trillion to be spent through the National Infrastructure Pipeline (NIP) projects to develop a wide range of infrastructure across the nation. This spending is supposed to occur between 2019 – 2025, which is a significant investment over a period of six years for a country like India. The importance of infrastructure for development of the nation and upliftment of the marginalized section of the society is widely known. In spite of the ambitious targets set by the government and the urgency of development of infrastructure, it is observed that many projects do not materialize due to a variety of reasons (and in certain cases, due to lack of finance). The capability of raising funds differ with levels of the government such as the central government, state government and municipal government. In this study, we present how infrastructure projects have been financed in India, their advantages and disadvantages, and discussing global practices of infrastructure finance. The outcome of this study is to understand the bottlenecks in infrastructure finance and suggest a way forward.

Keywords: Project delivery, Infrastructure finance, Infrastructure development, and Public Private Partnership.

1. INTRODUCTION

There are many reports which provide various estimates of infrastructure spends to be done by different countries in coming decade [1]. As per the Global Infrastructure Outlook 2017 published by Oxford Economics, the estimated number for the global infrastructure investment is about $94 trillion during the period 2016 to 2040. The expected investment in Asia alone is about 50%. The rate of urbanization in India is also rising rapidly (expected to be 42% in 2030) also increases the need for increased infrastructure in urban areas. The National Infrastructure Pipeline (NIP) is a $1.4 trillion scheme which will be spent between 2019-2025. At present, the planned spending by state and central government is about 78% while the spending envisaged by the private sector is about 22%. This indicates that there is difficulty faced by the government in terms of mobilizing private finance.

The Smart City Mission projects (launched in 2015) have not delivered much in terms of changes in the city infrastructure services. The smart city mission required cities to raise money for projects and carry out projects on public private partnership basis. This has not been a very successful attempt. At the same time, we see a lot many kms of metro rail deployed in various urban areas which are steered by joint venture of central and state governments.

The aim of this paper is to look at the way infrastructure projects are delivered in India with a special focus on the financing aspect.

2. LITERATURE REVIEW

Financing of infrastructure project is a vast topic as well as a well-researched topic. There is a significant amount of literature which is available on the topic of infrastructure finance in the form of text books [2-4]. These textbooks provide a good background information on the sources of financing, their suitability for a particular project, risk considerations, financial modelling, etc. Project finance is a tool which is very commonly used for financing infrastructure projects and there are books dedicated to project finance which is essentially a non-recourse finance where the lender is providing money for a specific project through creations of “special purpose vehicle” (SPV). The textbooks mentioned above (and numerous others)

cover these aspects in great detail. The literature review presented here captures the current areas of interest in the area of infrastructure finance in general and specific to developing countries in India

The multi-lateral development banks such as the World Bank, Asian Development Bank are major financers for many infrastructure projects across the world. There are Japanese, Chinese, German, French, etc. development assistance banks as well (for ex. JICA, KfW, AfD, etc.). Wang (2017) analyses the impact of creating of the two new multi-lateral development banks (MDB) in the last few years. He points out that MDBs are ideally placed to finance infrastructure projects as they have ability to raise money as well as have a strong technical capacity [5]. Sahoo and Bishnoi (2016) looks at the role of Japanese overseas development assistance to India in great detail and analyse the impact on the infrastructure creation in India [6]. There are many research studies which discuss the role of China as a big player in offering development assistance around the world through mega initiatives such as the Belt and Road Initiative [7,8]. There are studies which discuss the *competitive* nature of Chinese and Japanese assistance for infrastructure development [9,10]. Della and Gatti (2014) looks at the trends of infrastructure finance in the past two decades. They enlist various ways in which private investor can be part of the infrastructure finance on equity as well as debt side [11].

There is a wide range of literature available on risks associated with infrastructure project financing and possible mitigation measures [12-14]. Henckel and McKibbin (2017) looks at infrastructure spending in general and tries to enlist challenges and offer remedies [15]. Ahmed (2017) discussed possible risk mitigation policies in a project environment [16]. Greer (2020) looks at the portfolio of infrastructure finance options and also highlights the risks associated with the options [17].

The public-private partnership as a project delivery and financing mechanism has been implemented in India for more than 3 decades now and there is a lot of literature associated with that in the form of sectoral analysis like road [18], water [19], energy [20], waste management [21], etc. There are studies which point out to finance as a constraint for delivering infrastructure projects and offer privatization as an option for finance [22,23].

There is a considerable interest in the area of financing green infrastructure projects as well as projects related to renewable energy [24-25]. The newer trends in finance also include interest in exploring the asset tokenization through block chain technologies to create more liquid finance options [26,27].

The financing of infrastructure projects is unique as these are capital intensive projects (in many case welfare projects with lesser returns due to pricing issue) and have long gestation period. Within a particular country, different level of governments has different level of access to finance. This is an interesting area of research, where active researchers and practitioners are trying their best to make sure that finance is not a bottleneck in development of infrastructure in a particular region. The study undertaken in this paper is a modest attempt to do the same.

3. METHDOLOGY

As outlined in the introduction section, the necessity of building infrastructure is already established. The question that remains to be answered, is the way in which resources can be made available to these infrastructure projects. The focus of this study is on the financing aspect of the resources. In general, any project will have a certain equity component and a certain debt component. As infrastructure projects are solicited by the government ministry/agencies, there are many times provision of budgetary support for equity component (sometimes there is an in-kind support in form of land or other resources). The project still needs to generate additional funds to initiate the projects.

The Objective of this paper is to understand:

1. What are the different sources that are available for financing infrastructure projects in India?
2. Understanding alternative sources of finance that can be made available
3. Outlining ways to reduce unnecessary cost and time over runs and make the financing more efficient

The study will utilize various reports presented by the Government of India on infrastructure in India in the recent times as well as reports from industry groups/consultants such as FICCI, Ernst and Young, McKenzie, etc. to present the (a) existing models of infrastructure finance in India (b) overview of project delivery model and (c) challenges in infrastructure finance. Case studies from urban infrastructure will be used to present the often-used financing modes in infrastructure projects in India. Based on the compiled data and observations, meaningful inferences are drawn. These inferences and way forward are presented in the discussion section.

4. INFRASTRUCTURE FINANCE IN INDIA – A FEW EXAMPLES

It is worth noting here that developing countries like India face huge infrastructure deficit across various sectors. The solution in many cases is a combination of provision of new infrastructure service (supply side solution) and reducing the demand for the said service (demand management solution). For example, for solid waste management sector, the supply side solution would entail building a new waste management plan (which needs capital investment) or demand side solutions such as banning single use plastic, disposing of kitchen waste by vermicomposting means in housing societies, etc. (which needs regulation rather than finance).

The institutions like NITI Aayog/planning commission prepare vision plans for India (with planning horizons of 15 years). These vision plans are

then translated into various schemes/missions or yojanas like the Smart City Mission, PM Gatishakti Yojana, Swachh Bharat Yojana, etc. These schemes/missions are collection of projects. For example, a Sagarmala Project will have under it various road and rail connectivity projects (fulfilling a larger and national role towards improving logistic movement in India). Careful planning and thinking goes into selecting a *right* project. Developing countries like India do not have access to lot of capital, and therefore must choose to spend the available capital wisely. Therefore, choosing the right project to deliver a certain infrastructure service becomes imperative.

Projects have associate with them certain cost centers (capital expenditure – capex and operational expenditure – opex) as well as revenue centers (user fees/taxes/efficiency gains). For a project to be viable, the revenue center has to be robust which will cover the cost of the project. Traditionally, the capex can be funded by budgetary allocation (state funds/municipal funds) and by raising debt from banks, MDBs, overseas development assistance, agencies such as LIC, HUDCO, by tapping capital markets (bonds, InVITs), etc. The opex should ideally by revenue through the projects but in certain cases some debt instruments or budgetary support can be used for subsidized operations.

Therefore, detailed project reports are prepared for major infrastructure projects which are vetted by committees such as the PPP Appraisal committee before a project gets a final go ahead.

4.1. PUBLIC PRIVATE PARTNERSHIP (PPP)

Project delivery models play an important role in infrastructure development. The commonly used project delivery models are based on risk sharing or allocation of responsibilities. For infrastructure projects, some of the important questions are which agency is going to be responsible for the design element of the project?, which agency is arranging finance?, which agency will be carrying out construction or execution?, which agency is responsible for operation of the infrastructure project ? which agency bears the risk of revenue?, etc. Based on these generalized questions, there are various models which are available such as design – build (DB). Build Operate Transfer (BOT), Design, Finance, Build, Operate and Transfer (DFBOT), Hybrid Annuity Model (HAM), Toll-Operate-Transfer (TOT), etc. and are listed in the table below (not an exhaustive list).

PPP Mode	Design	Finance	Execution	Operation	Revenue
DB	G*	G	G*	G*	G
BOT-Annuity	P	P	P	P	G
DFBOT	P	P	P	P	P
HAM	P	G/P	P	P	G
TOT	G*	G	G*	P	P

Note: G – Government responsible; G - Government pays fee to a private party to get a particular task done; P – Private sector responsible*

Table 1: PPP models – distribution of responsibilities

In the following section, six examples of infrastructure projects and their financing mechanism are discussed.

Delhi Metro Rail project (phase 1) was executed around the year 1999 and it cost somewhere around US $2.1 billion (roughly Indian Rupees 10,000 crore). This is an example of design-build. The metro rail projects in India are a public-public partnership project, where a SPV is formed with nearly equal share from state and central government which bears about 40% of the cost of the project (Equity) and the rest is generally debt. The debt in this case was raised from the Japanese International Cooperation Agency (JICA) to the tune of 58% at a very low interest rate of about 1%. The government offered certain percentage of subordinate debt to the SPV (called Delhi Metro Rail Corporation or DMRC in this case) for land procurement. The subordinate debt is a useful tool for raising more money as it can be shown as equity initially and can increase the financial leverage. About 1% of grant also was extended to the project (since the year 2007, viability gap funding (VGF) is commonly used term for such assistance) [28].

Alandur sewerage project (approx. year 1999-2000) is also an example of design build. The total project cost was 40.46 crores, of which about 14.46 crores (more than 1/3rd) was raised by upfront user charges from the general public. The project received grant of Rs. 4 crores and they had to raise debt of about Rs. 22 crores [29].

The Water Treatment Plant, Haldi (2008) is an example of Build-Operate-Transfer project worth Rs. 140 crores. In this case the private agency raised the money required for capex and opex. The public agency had to forego the operational revenue for the duration of concession period [30]

L&T Metro Rail, Hyderablad (2010) is a massive project worth Rs. 16,378 crores. The promoter group's equity is Rs. 3,440 crores and the debt was about Rs. 11,480 crores from syndicate of State Bank of India. The project received VGF of Rs. 1,458 crores. The interest rate here was about 10% and makes the finance cost very high (especially compared to all other public metro projects such as Delhi metro) [31].

Karnataka State Highway Improvement project (2020), utilized the HAM model where the government assistance is about 75% to initial capital. The total project cost borne by the state (through Asian Development Bank) is Rs. 2,784 cores while the private sector is taking care of Rs. 1,184 crore [32].

NHAI recently (2020) offered the Macquarie Singapore group the rights to operate 9 NHAI highways in Andhra Pradesh and Gujarat at consideration of Rs. 9,681 crore. This is an example of TOT model as well as asset monetization. The government is trying to raise money from existing highway assets to finance future assets. The fetched price was 1.5 times than the expected price [33].

The projects are roughly listed in the order of the years in which they were conceived and implemented. If we further, take a look at the Karnataka Highway Improvement Project, one can see, a lot of capital cost is borne by the public agency (this is an example of Hybrid Annuity Model or HAM). Finally, the example of a Toll-Operate-Transfer model is given, in which the capital is provided for by the government completely. If we look at financing landscape from these examples, one can see the government was initially the agency which used to borne capital expenses. Then, through the BOT schemes, the burden was taken by the private agency (with some assistance from the government in form of VGF). Again, we see some shift towards government spending through models such as HAM. Finally, we see asset monetization, where the government is doing the funding initially, but tries to recover later through TOT model.

5. RESULTS AND DISCUSSION

The aim of this paper is to understand various financing mechanism for infrastructure projects in India. Through the examples presented in the section 4, some of these financing schemes are described. A few important considerations are presented below:

1. Making the projects financially attractive

In section 4, we have seen a variety of PPP model in which the contribution of the private sector in terms of finance varies. In certain cases, they are provided with VGF as well. The reason for that is, the projects such as solid waste management, public transportation, water supply, etc. are very difficult for any agency to recover the cost, let alone make profit. There are variety of reasons for that, such as willingness-to-pay by the user and in some cases willingness-to-charge by the government / political entities. India, being demographically diverse, it sometimes is a challenge to make the general public bear the actual cost of the infrastructure service (which is then in general subsidized).

Attracting capital from the private sector, without clear idea about revenue potential is going to keep the private sector finance away. The government is trying to privatize many routes on Indian railways, but the competition from relatively cheaper trains from the Indian Railway is keeping the private sector away from such venture. If the expectation is of private finance, there is a need to make that sector attractive. The road sector and the power generation sector attract a lot of private capital, as the private sector finds those sectors relatively easy to make money from (though there are failures there as well).

2. The cost of financing

A number of projects executed by the government agencies will get capital from MDBs at a lower interest rate. The private sector will not have access to such capital at lower interest rates. There are few metro projects which are being done presently with a higher cost of borrowing, but the government is allowing them to exploit the real estate around the transit station to improve profitability of the projects. Provision of VGF will also make project financially attractive to the private player.

3. Clearances/risks/approvals/land

The Ministry of Statistics and Project Implementation (MoSPI) tracks close to 1583 projects in India of which only a few are on track in terms of time. Most of them are having time as well as cost overruns. The reasons for such delays is land acquisition, getting clearances, protests by local people etc. Attracting private capital in such cases is difficult. The asset monetization plan reduced all these risks to the private player. The government also is working hard to solve these issues by using land pooling and land purchase models to solve the land problem. Drafting newer environmental impact regulations to make permissions relatively easier. It is still work in progress.

4. New instruments such as REITs/InVITs

Across the globe stock market instruments such as Real Estate Investment Trust (REIT) and Infrastructure Investment Trust (InVIT) are used as a financing mechanism. The NHAI is actively looking at InVITs for financing mechanism. The private sector use of InVIT is already there (IRB Infrastructure). Use of bonds for financing is also a way of using stock market for financing infrastructure projects.

5. Embracing new technology

The NITI Aayog is recognizing the need for trained project professionals. Public agency officials are required to undergo training for MDB funded projects. Technologies such as the Building Information Modeling can bring the stakeholders on the same table and reduce miscommunication as well as present clear idea about the risks involved. These technologies can reduce certain delays in project, which will make them attractive to the private sector.

6. CONCLUSION

In this study, an attempt is made to look at the way the infrastructure project delivery is done in India with a

special focus on the financing aspects over the past decades. The paper also tries to look at why a certain type of financing is used in a particular project as well as different models that can be applied. Government is one of the biggest infrastructure spenders but there is a vast scope for private sector to enter this area. The post liberalization period (after 1991) brought a lot of private capital and the speed of infrastructure development has picked up. The crisis of Non-Performing Assets (NPAs) is still there but it stopped the financing to a lot of private players in 2012-2014. Lack of due diligence by the private sector is also to be blamed here. The government had to react to such crisis in the form of new models such as HAM and TOT. The government has various instruments at its disposal to raise finances (for example the Central Road Fund which contributes more than Rs.90,000 crore to the corpus). The government has always competing interest in terms of spending money on building infrastructure or spending on social welfare schemes. The investment by private sector in infrastructure will allow governments to spend more on healthcare, education, etc. Government and the public agencies are working towards the 'Ease of doing business" in India and some of the efforts can be seen bearing fruits. A concerted effort is needed by all the stakeholders to build quality infrastructure in India and raise the standard of living of one and all.

REFERENCES

[1] "National Infrastucture Pipeline", dea.gov.in, https://dea.gov.in/sites/default/files/Report%20of%20the%20Task%20Force%20National%20Infrastructure%20Pipeline%20%28NIP%29%20-%20volume-i_1.pdf (accessed May 7, 2023)

[2] Pretorius, F., Chung-Hsu, B.F., McInnes, A., Lejot, P. and Arner, D., 2008. Project finance for construction and infrastructure: principles and case studies. John Wiley & Sons.

[3] Gatti, S., 2012. Project finance in theory and practice: designing, structuring, and financing private and public projects. Academic Press.

[4] Tinsley, R., 2014. Advanced Project Financing: Structured Risks.

[5] Wang, H., 2017. New multilateral development banks: Opportunities and challenges for global governance. Global Policy, 8(1), pp.113-118.

[6] Sahoo, P. and Bishnoi, A., 2016. Role of Japanese official development assistance in enhancing infrastructure development in India. Contemporary South Asia, 24(1), pp.50-74.

[7] Chen, M., 2021. Infrastructure finance, late development, and China's reshaping of international credit governance. European journal of international relations, 27(3), pp.830-857.

[8] Anguelov, D., 2021. Banking 'development': the geopolitical–economy of infrastructure financing. Area Development and Policy, 6(3), pp.271-295.

[9] Dadabaev, T., 2018. Japanese and Chinese infrastructure development strategies in Central Asia. Japanese Journal of Political Science, 19(3), pp.542-561.

[10] Jiang, Y., 2019. Competitive partners in development financing: China and Japan expanding overseas infrastructure investment. The Pacific Review, 32(5), pp.778-808.

[11] Della Croce, R. and Gatti, S., 2014. Financing infrastructure–International trends. OECD Journal: Financial Market Trends, 2014(1), pp.123-138.

[12] Matsukawa, T. and Habeck, O., 2007. Recent trends in risk mitigation instruments for infrastructure finance: innovations by providers opening new possibilities.

[13] Kumar, L., Jindal, A. and Velaga, N.R., 2018. Financial risk assessment and modelling of PPP based Indian highway infrastructure projects. Transport Policy, 62, pp.2-11.

[14] Tirumala, R.D. and Tiwari, P., 2023. Growing of Age in Risk Mitigation: Funded and Unfunded Participation. In Advances in Infrastructure Finance (pp. 159-185). Singapore: Springer Nature Singapore.

[15] Henckel, T. and McKibbin, W.J., 2017. The economics of infrastructure in a globalized world: Issues, lessons and future challenges. Journal of Infrastructure, Policy and Development, 1(2), pp.254-272.

[16] Ahmed, R., 2017. Risk mitigation strategies in innovative projects. In Key Issues for Management of Innovative Projects. IntechOpen.

[17] Greer, R.A., 2020. A review of public water infrastructure financing in the United States. Wiley Interdisciplinary Reviews: Water, 7(5), p.e1472.

[18] Koul, P., Verma, P. and Arora, L., 2021. Road infrastructure development under PPP model in India: a credit rating perspective. Built Environment Project and Asset Management.

[19] Dharmapuri Tirumala, V.R.R.S., Tiwari, P., Sawhney, A. and Kodumudi Pranatharthiharan, K., 2020. Analyzing configurational paths for successful PPPs in Indian urban drinking water sector. Journal of Infrastructure Systems, 26(3), p.04020023.

[20] Shrimali, G. and Sen, V., 2020. Scaling reliable electricity access in India: A public-private partnership model. Energy for Sustainable Development, 55, pp.69-81.

[21] Dolla, T. and Laishram, B., 2020. Factors affecting public-private partnership preference in Indian municipal waste sector. International Journal of Construction Management, 20(6), pp.567-584.

[22] Szimba, E. and Rothengatter, W., 2012. Spending scarce funds more efficiently—including the pattern of interdependence in cost-benefit analysis. Journal of infrastructure systems, 18(4), pp.242-251.

[23] LÃM, V.Q., 2019. Public Private Partnership: Solution To Shortage Of Capital For Infrastructure In HCMC. Journal of Economic Development, pp.16-20.

[24] Qadir, S.A., Al-Motairi, H., Tahir, F. and Al-Fagih, L., 2021. Incentives and strategies for financing the renewable energy transition: A review. Energy Reports, 7, pp.3590-3606.

[25] Yang, Q., Du, Q., Razzaq, A. and Shang, Y., 2022. How volatility in green financing, clean energy, and green economic practices derive sustainable performance through ESG indicators? A sectoral study of G7 countries. Resources Policy, 75, p.102526

[26] Tian, Y., Lu, Z., Adriaens, P., Minchin, R.E., Caithness, A. and Woo, J., 2020. Finance infrastructure through blockchain-based tokenization. Frontiers of Engineering Management, 7, pp.485-499.

[27] Zhang, Y., Wang, Z., Deng, J., Gong, Z., Flood, I. and Wang, Y., 2021. Framework for a blockchain-based infrastructure project financing system. IEEE Access, 9, pp.141555-141570.
[28] Goel, Rahul andTiwari, Geetam. “Promoting Low Carbon Transport in India”. https://unepccc.org/wp-content/uploads/2014/08/case-study-of-metro-final.pdf (accessed May 7, 2023)
[29] “Public Private Partnership Projects in India”. https://www.pppinindia.gov.in/toolkit/pdf/case_studies.pdf (accessed May 7, 2023)
[30] “Compendium on Public Private Partnership in Urban Infrastructure”. https://ppp.worldbank.org/public-private-partnership/sites/ppp.worldbank.org/files/documents/India_urban-infrastructure.pdf (accessed May 7, 2023)
[31] “L&T Metro Rail (Hyderabad)”. https://www.lntidpl.com/businesses/exited-projects/exited-projects/lt-metro-rail-hyderabad/ (accessed May 7, 2023)
[32] Shiwakoti, Dinesh and Dey, Devayan. “The Hybrid Annuity Model for Public Private Partnership in India’s Road Sector”. https://www.adb.org/sites/default/files/publication/820206/sawp-094-ham-ppps-india-road-sector.pdf (accessed May 7, 2023)
[33] “Macquarie bags first project under toll-operate-transfer with Rs 9681.5 crore bid”. https://www.businesstoday.in/latest/economy-politics/story/macquarie-bags-first-project-under-toll-operate-transfer-248437-2018-03-01 (accessed May 7, 2023)