

# RISK ANALYSIS AND MANAGEMENT FOR PUBLIC-PRIVATE-PARTNERSHIP INFRASTRUCTURE PROJECTS IN INDIA

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**Abstract** – Infrastructure projects are going through a lot of difficulties, mostly connected with non standard established financing in country. During and after transition period, undeveloped, insufficient but before all obsolete infrastructures in India became an essential problem for further development of main economic resources (transportation, agriculture, mining, tourism etc.). Infrastructure network is necessity for the development of different sectors (energetic, agriculture, industry, commerce etc.). The analysis of potential risk elements, throughout the processes from bidding to operational infrastructure projects, is one of the most important elements to maximizing profit and functionality, and properly develop country infrastructure, while mineralizing potential difficulties that may arise. Much of the risk of a PPP project comes from the complexity of financing, taxation, law regulatory, acquired technical documentation and construction process involved in a major infrastructure venture. Main risks, their analyze and management on infrastructure projects are explained in this paper. After risk analyze, risk management framework are presented for managing risks on PPP projects in India. Main purpose of this paper is to investigate critical risks associated with Build Operate Transfer projects in India.

**Keywords:** Public private partnership (PPP) projects, Risk analyze and management, Project financing, infrastructure projects etc.

## 1. INTRODUCTION:

Background of public/private partnership projects  
In its widest sense a public/private partnership (PPP) may be defined as “a long term relationship between public and private sectors that has the purpose of producing public services and infrastructure”. Public/private partnerships

bring public and private sectors together in long term contracts. PPPs (public/private partnership) encompass voluntary agreements and understandings, service-level agreements, outsourcing and private finance initiative. A PPP projects therefore usually involves the delivery of a traditional public sector service and can encompass a wide range of options. General idea of that concept is to mobilize to use private sector capital to generate economic development, and to deliver value for money to the public sector, and the higher costs of private sector financing and the level of returns demanded by the private sector investors must be outweighed by lower whole-life costs and increased risk transfer. One of the main goals is to develop infrastructure projects including roads, hospitals and schools, without the response to the limited capital of the public sector and utilizing superior cash and project management capacity of the private sector. As the infrastructure has great impact on the development of whole economic of the country, the main reason for the delayed development of Indian economy is many unfinished infrastructure projects.

## 2. LITERATURE REVIEW

In this connection the following literature has been reviewed,

Albert P. C. Chan, John F. Y. Yeung, Calvin C. P. Yu, Shou Qing Wang and Yongjian Ke [1] has focused on how risks should be assessed and allocated for PPP projects in China in his paper titled, Empirical Study of Risk Assessment and Allocation of Public-Private Partnership Projects in China. It also assists in risk response planning and control for future PPP project in China.

Schaufelberger.J.E, Isr Wipadapisut [2] has focused on study of build-operate-transfer (BOT) project financing strategies from the perspective of project sponsors in his paper titled, Alternate Financing Strategies for Build-Operate-Transfer Projects. This paper shows the financing strategy for a BOT project includes the selection of the appropriate mix of equity and debt financing, and the identification of appropriate financing.

Waghmare.A.P, Dr. Pimplikar.S.S [3] has focused on the parameter investment value will be increased when

treatment is done on risk .his paper has to be evaluated and calculated the influence of the identified risk towards the project feasibility. Also, risks that overshadow the construction project have to be calculated as an influential factor towards the failure of a project. This paper investigates to know the feasibility of project investment by calculating the risk factors and treatment. The author used Risk probability matrix to obtain the risk priority, which then continued with financial analysis for the feasibility study and also sensitivity analysis.

Shou Qing Wang, Robert L. K. Tiong, S. K. Ting and D. Ashley [4] have focused on Evaluation and management of **political risks in china’s BOT projects**. This paper is based on the findings from an international survey on risk management of build-operate-transfer (BOT) projects in developing countries, with emphasis on infrastructure projects in China. It discusses specifically the criticality of the political and force majeure risks.

J.H.M.Tah, V. Carr [5] has focused on a consistent methodology for construction project risk management, including a generic process model and underlying information model, common language for describing risks and remedial actions, fuzzy knowledge representation model to support quantitative risk analysis, and prototype software implementation in his paper title, Knowledge-Based Approach To Construction Project Risk Management.

### 3. OBJECTIVES

The objectives of this paper are as follows:

- To understand the PPP.
- To understand and study of risks in PPP.
- To identify and examine the risks in BOT infrastructure projects.
- **To evaluate the critical risks associated with India’s BOT infrastructure projects.**
- To evaluate the effectiveness of mitigating measures those are available to manage these risks.

### 4. PICTORIAL REPRESENTATION OF RISK MANAGEMENT SYSTEM

The process of risk management is broken down into the risk management system in figure 1.which shows the sequence for dealing with risk. Naturally the risk management system must be applied to each option under consideration. Generally the stages are:

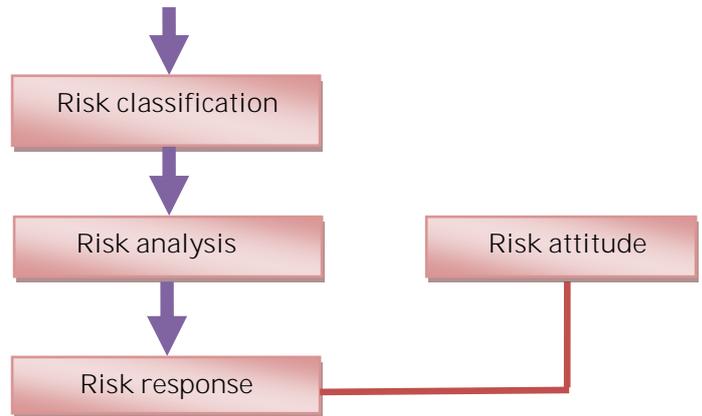


Fig -1: Risk management system

### 5. METHODOLOGY OF STUDY

The methodology developed for this study includes (1) a comprehensive literature review together with some case studies to identify initial lists of risks associated with BOT projects in different infrastructural sectors and generally available mitigating measures for these risks; (2) unstructured interviews and discussions to filter the risks and measures identified in Step 1; and (3) an international survey to evaluate the criticality of these risks and the effectiveness of corresponding mitigating measures.

#### 5.1 The survey

Rating of risk criticality and mitigation measure effectiveness

The evaluation of the criticality of risk is a complex subject concealed in uncertainty and vagueness. The vague terms are unavoidable because it is easy for project managers to access risks in qualitative linguistic terms. To improve the preciseness and reliability of survey replies, a six-degree rating system for the criticality of risk and the effectiveness of mitigation measures have been adopted. (Six Degree of rating system is a concept used by Dan Armstrong in an article “Six Degrees of Project Management”) as shown in Table 1,

Table-1: Rating system for risk criticality and mitigation measure effectiveness

Ratings	Risk criticality	Mitigation measure effectiveness
0	Not applicable	Not applicable
1	Not at all critical	Not at all effective
2	Only slightly critical	Only slightly effective
3	Critical	Effective

Risk identification

4	Very critical	Very effective
5	Very much critical	Very much effective

### 5.2 Data collection

Survey is mainly focused on Infrastructure sector of India and it targeted following industries.

- Toll Road Projects

The respondents, who were asked various questions pertaining to various risks they faced during project conceiving to commissioning stages of Infrastructure projects.

### 6. RISK MANAGEMENT FRAMEWORK FOR BOT INFRASTRUCTURE

A risk management framework for investing in India's future BOT infrastructure projects can be proposed as follows.

Step 1: List all risks associated with the proposed BOT infrastructure project and then analyze these risks in order of importance. The more critical the risk, the more attention should be paid to it.

Step 2: For each risk, list corresponding mitigation measures as more as possible, and then examine the availability of mitigating measures in sequence based on their effectiveness. The more effective the measure, the higher the priority for adoption. Sometimes, a combination of several mitigating measures is needed to be adopted.

Step 3: For each risk and its mitigating measures, negotiate with Indian government and related entities to incorporate the risk mitigation measures, and fine tune the concession agreement and other agreements as much as possible to ensure that all of these risks are adequately covered.

Step 4: Allocate risks to related parties according to the principle that risk should be borne by the party most capable of controlling it. An optimal allocation of risks depends on the relative bargaining power of the parties and the potentiality of reward for taking the risks

Step 5: Adopt the risk allocation and security structure and enter into financing process for the project.

### 7. CONCLUSION

The risk management framework proposed by this project will be easier to apply than others. It incorporates the findings from this research and provides step-by-step guidelines for foreign companies who intend to invest in India's infrastructure projects in the future. It also has the potential to help national, provincial, and city government to examine their approach to and services in support of BOT infrastructure projects. It suggests that mechanisms be reviewed to improve the communication and coordination links between different levels of government, that thought be given to developing mechanisms to coordinate actions by different government agencies.

### 8. FUTURE SCOPE

1) The present work is done on PPP in infrastructure sectors of toll road project. Furthermore, it can be used in various departments of infrastructure sectors of Indian Government like Power plants, Aviation, Telecommunication, Social Infrastructure projects like Sewage, Drinking water etc.

2) Study carried out in this project work on the six degree rating system methodology does not deals with the disputes and arbitration in projects, but this method will be more effective and comprehensive if disputes and arbitration is taken into account.

### ACKNOWLEDGEMENT

I wish to express my thanks to Professor B.V.Birajdar (Guide and Head of Civil Engineering Department), for the input he has given during the preparation of this work. I wish to express my sincerely thanks to Dr. S.V. Anekar, Principal, Tatyasaheb Kore Institute of Engineering and Technology, Warananagar, who contributed with important supervision in thesis preparation and for supporting me to do this dissertation work. I acknowledge with thanks to faculty, teaching and non-teaching staff of the department, Central library and Colleagues.

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