

THE INTERNATIONAL JOURNAL OF BUSINESS & MANAGEMENT

Critical Risk Factors of PPP Infrastructure Projects in India: A Practitioner's View

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Abstract:

India has been adopting the Public Private Partnership mode of Infrastructure developments more aggressively since the last decade of 20th century. From Gujrat to Arunachal, Kashmir to Kanyakumari respective governments have tried to rope into private partnership for developing Infrastructures of their specified need and thereby facilitating private source of funding. However, infrastructure asset creation through private funding has been a mixed kind of experience so far in India. The bottle necks in Infrastructure development through PPP, thus needs to be reviewed critically so as to look forward for a realistic win-win model. This is more so important as because most of the PPP projects awarded during an aggressive push period of PPP in the 1st decade of 21st century have entered into their second most vulnerable phase of O&M. In this study, primarily it was intended to identify critical risk issues and about the perceptions of respondents on some related aspects. Six hypotheses have been postulated to achieve the goal of the study. All Indian surveys in three stages among the different stakeholders i.e. promoter, government, consultant, lenders and other categories have been carried out during the period between 2009-2013. The total targeted respondent from all categories was 89. The survey responses were statistically analyzed for quantifying the results for qualitative analysis. A detailed case study analysis of 30 infrastructure projects was also carried out and survey findings have been validated through case study comparison. Twelve (12) most critical issues were identified. Ten (10) most critical factors were identified and ten (10) very critical factors were identified. Perceptions relating to some of the important aspects have also been highlighted. ANOVA test of Second Stage of survey responses showed that all the six hypotheses of the study stands as the respondents had concurred without any significance. Overall, it is revealed that PPP in India is still a most sought after viable alternative for Infrastructure asset creation.

Keywords: Infrastructure, Public Private Partnership (PPP), Critical Factors

1. Introduction

1.1. Background

Ever since the economic reforms started two decades ago, India has been trying to lead the developing nations in terms of building their infrastructure. The challenge of government's fund constraint has been tried to put behind by allowing flow of funds from private sources with regulatory control in government own hand. Thus, the Public-Private Participations meant to form a real partnership between the Public and the Private entities, which was a comparatively new concept for infrastructural development business in India had gained momentum with the starting of the open market economy in last decade of the 20th century. A number of road sector projects in India had been awarded under the most sought after Build Operate & Transfer (B.O.T.) model of Public Private Partnership (PPP). Similarly, several other infrastructural projects in other important areas like power, communications, housings, aviation etc. have been implemented under different modes of PPP since then.

However, with the global economic crisis that had knocked heavily at the doors of Indian economy during last couple of years, it was found that developmental bottlenecks for infrastructure sector has escalated in spite of the best efforts by the government. The participation rates in recent biddings of PPP projects were also not encouraging, especially in Highway sector. Recently, there had been concerning reports that NHAI, which had executed highest numbers of PPP projects in India, wanted to move back to the old EPC mode.

Most of the infrastructure projects through Public Private Participation in India have now entered into their second vulnerable phase of Operation & Maintenance (O &M) overcoming the critical construction phase, as these were awarded during PPP's peak time in the first decade of 21st century. Indian Project Managers still have not attained the maturity to deal with critical issues likely to come up in the O&M phase. After-all, good judgement comes out of experience and experience often comes from handling of criticality.

1.2. Focus on Public Private Partnership

Infrastructure development in India has largely been in the Government domain. However, for last two decades Government of India (GoI) and most of the State Government(s) have been putting an increasing focus for involving the private sector in infrastructure creation under the public private participation delivery framework. Thus, Public-Private Partnership (PPP) has got an ever rising focus in Indian business and economic scenarios. Primarily, it describes a government service or private business venture which is funded and operated through a partnership of government and one or more private sector companies. These schemes are sometimes referred to as PPP, P3 or even P³. These schemes mainly refer to a long-term contractual partnership between the public and private sector agencies, specifically targeted towards financing, designing, implementing and operating infrastructure facilities and services in the State.

In other terms, this is essentially an agreement between government and the private sector regarding the provision of public services or infrastructure. The social priorities with the managerial skills of the private sector, relieving government from the burden of large capital expenditure, and either transferring or sharing the risk by the party capable of best managing, are the prime agendas in a PPP framework. Generally, these PPPs aim to achieve the twin objectives of high growth and equity on a sustainable basis.

1.3. Risk perception of PPP project developments in India

As in case of other infrastructure development modes, a PPP may also involve several risks and a balanced sharing of these risks between the public and the private sector partners, is essential for enduring success of this framework. The major risks associated with PPP projects could be broadly classified under:

- Feasibility / Viability
- Developmental Risk.
- Constructional Risk.
- Operation and Maintenance Risk.
- Legal Risk.
- Regulatory Risk.

It is interesting to note that the perception levels for various risks of a particular PPP projects may vary from stack-holders to stack-holders and may not be in unison always.

2. Need to Address the Issues

Creation of durable and high quality infrastructure is a prerequisite for rapid economic development and requires sustained investment well supported by technological innovations, skilled workforces and excellent project managements. For governments alone, to bring together all these elements is not always possible. This realization has brought together the public and the private sector in a mutually beneficial relationship in the form of Public Private Partnerships (PPPs) to execute not only infrastructure projects but also engender innovative strategies for social development. However, bringing in private capital and experience through PPPs involves transfer of valuable public assets as well as foregoing future revenues in the form of concessions. It is expected that such arrangements always enjoy high credibility in the public eye, due diligence, transparency, objectivity and probity. To ensure the above, the risk involved in a PPP project must be predefined and clearly understood by all the stack holders. Keeping above in mind, it was felt by the authors to undertake a critical review of the some of the aspects of Public-Private Participations in India's infrastructure development projects and to particularly address the risk factors involves in those.

2.1. Aim & Objective of the Study

The primary aim of the study is to identify issues and constraints of Public Private Partnership (PPP) infrastructure development which are foremost in the minds of market players/ stake holders.

In specific the study proposes to 1) Identify the critical risk issues/factors of PPP projects in infrastructural development of India 2) Analyze various factors contributing to high risk exposures, 3) See risk allocation preferences and party capable of managing the risk, 4) Identify deficiency in project managements, 5) Factor leading to success and hindering performance, 6) Look at the overall implications of PPP projects for infrastructure development and finding a path towards managing risks for these projects.

Further, it is aimed to elicit feedback to identify efforts required to ease the constraints and to formulate a suitable win-win model for public private partnership in infrastructure development projects in India. However, keeping in mind scope for this paper, only identification of critical risk factors and perceptions for some related issues have been looked into here under.

2.2. Research Hypothesis

To achieve the objectives of the study following six hypotheses have been formulated:

- Hypothesis 1: There is Developmental risk for a PPP project even after the decision to go for the project.
- Hypothesis 2: There exists financial risk for a PPP project even after Cost Benefit Analysis is carried out and the project is cleared.
- Hypothesis 3: There exists Construction risk for a PPP project even after the project is approved and construction is started
- Hypothesis 4: There is Performance and Operating risk for a PPP project once project is commissioned.
- Hypothesis 5: There exists Legal Risk in a PPP project once the project is decided for taking up.
- Hypothesis 6: There is Regulatory Risk for a PPP project once the project commences.

3. Methodology Adopted

The present study followed the survey questionnaire approach used in studies by Thomas A. V. (2002), Ho Y. and Wang H. (2008), Maniar H. (2010) and few others. In those studies, apart from quantitative analysis qualitative analysis was also performed. The objectives set forth in this study were basically divided into three sections: identification of critical risks in Indian infrastructure projects taken up basically through PPP route, risk allocation and management perceptions of the project participants/ stack holders, look at the linkage of performances Vs risk and development of risk assessment framework for Indian Infrastructure projects. A mixed approach of interviews, questionnaire survey (among Government representatives, promoters/developers, lenders, consultants as well as few other categories of personnel) and case studies were used for achieving the goals/above objectives.

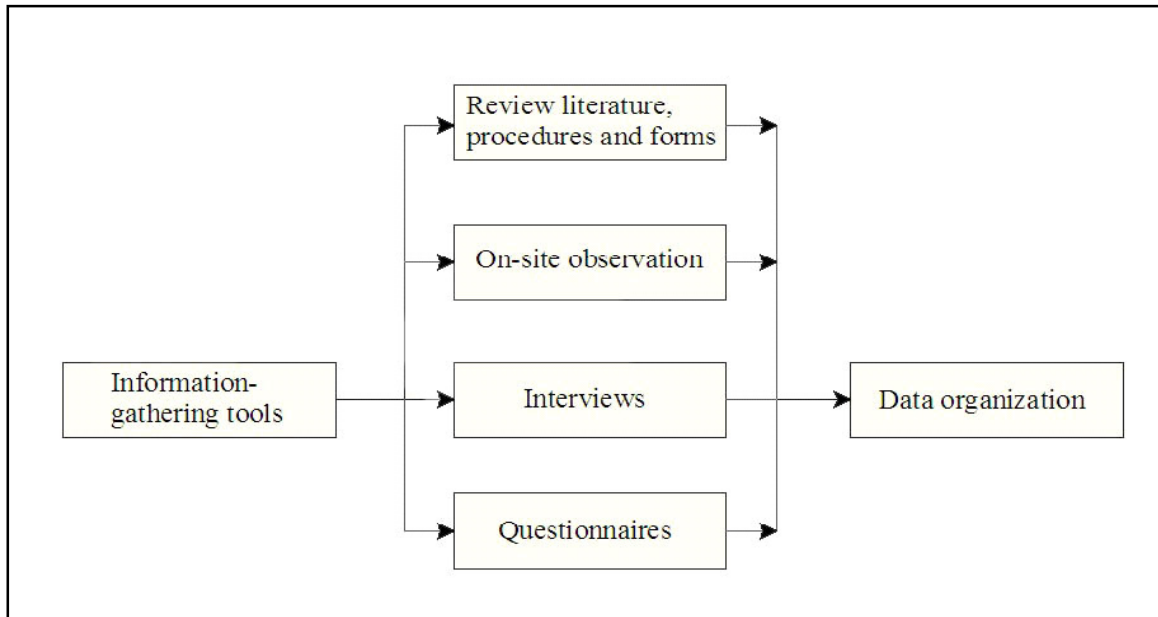


Figure 1: Details of information gathering techniques as per Awad (2006)

3.1. Detailed Study / Research Design

As mentioned in the preceding section, in the present study the author adopted a combined / mixed approach of literature survey, interviewing technique (informal) and structured questionnaire. The detail questionnaires were prepared after thorough literature survey and as much identified issues/ factors as can be incorporated had been put into.

The prepared questionnaires have been further subjected to test of reliability and validation with the help of standard statistical tools like Cronbach's alpha (Cronbach, 1951). This was used by many researchers in past (Mazumdar P,2010), (Thomas A V, 2002). Cronbach's alpha value of more than 0.60 indicated that data collected through the set out questionnaires were fairly consistent.

Category of respondent	Cronbach's Alpha
Promoter	0.65
Govt.	0.73
Lender	0.66
Consultant	0.60
Other	0.57

Table 1: Cronbach's Alpha for response regarding risk issues for taking up of PPP Projects in India

In the present study 5-point Likert scale is used to get responses of degree of importance (5=Most Important to 1=Not Important), degree of criticality (5=Most Critical to 1=Not Critical), degree of agreement (5=Strongly agree/Absolutely agree to 1=Not at all/disagree), degree of adequacy (5=Highly adequate to 1=Not adequate) and likewise.

3.2. Pilot Study

A preliminary version of questionnaire had been prepared and was given to 20 locally available representatives of Consultants, Contractor, Govt officials & others. They had been approached personally to get back the response and suggestions if any. 16 respondent of the pilot study responded with quite a few positive suggestions.

3.3. Final Survey

All India questionnaire surveys (in three stages) were conducted among four major stake holders/participants (Government representatives, promoters/developers, lenders and consultants) of Indian PPP projects for achieving the goal of the study. An 'Other' category of participants consisting of Academician, Students, Journalist and common users, who had knowledge of PPP projects, was

also included in the survey. However, as stated earlier, as per the scope of this paper portion of results and discussions relating to first two stage of surveys and targeted for establishing study hypotheses are only presented.

The total targeted respondent from all categories was 89. The survey responses were statistically analyzed for quantifying the results for qualitative analysis. A detailed case study analysis of 30 infrastructure projects was also carried out and survey findings have been validated through case study comparison. The category wise details of respondents for first two stages of survey are presented in Table 2, and 3.

Category of Respondent	No. of Respondents				Total Number and %
	Declared experience in PPP infrastructure projects				
	Very High >10 projects	High 5-10 projects	Moderate 2-4 projects	Low < 2 projects	
Promoters	2	8	11	4	25 (40.3%)
Govt.		5	2	3	10 (16.1%)
Consultants	1	4	6	1	12 (19.5%)
Lenders	1	6	1		8 (12.9%)
Others	1		1	5	7 (11.2%)
Total and %	5(8.1%)	23 (37.1%)	21 (33.9%)	13 (20.9%)	62 (100%)

Table 2: Category wise details of respondents for First Stage Survey

Category of Respondent	No. of Respondents				Total Number and %
	Declared experience in PPP infrastructure projects				
	Very High >15 years	High > 10 years	Moderate > 6 years	Low < 3 years	
Promoters	1	6	9	3	19 (35.8%)
Govt.		4	2	3	9 (17.0%)
Consultants	1	4	5	0	10 (18.9%)
Lenders	1	6	1		8 (15.0%)
Others	1		1	5	7 (13.3%)
Total and %	4 (7.5%)	20 (37.7%)	18 (34.0%)	11 (20.8%)	53 (100%)

Table 3: Category wise details of respondents for Second Stage Survey

As for the appropriate sampling sizes, going by guidelines of Nassiuma (2000) as shown on the following formulae.

$$n = \frac{Ncv^2}{cv^2 + (N-1)e^2}$$

n = sample size,

N= Population Coefficient of variation (0.5)

e= Tolerance at desired level of confidence (0.05 at 95 confidence level)

Substitutions in the formula yield a sample size of 47 for the instant case and from the above survey responses it could be seen that for every stages samples were fairly adequate.

4. Discussions and Analysis of Survey Data

Reliability of surveyed questionnaires has been assessed through evaluation of Cronbach's Alpha wherein values more than 0.60 are indicative of the fact that responses are internally consistent as per the given scale of measurement; The reliability of the survey results is expected to be high further because a high percentage of the respondents are experienced officials in their respective fields. Spearman's rank Correlation has also been evaluated for the different category of respondent to check if any large scale variations exist in their degree of agreement with the risk criticality issues. The high positive correlation between the group's members implies that there is a convergence of opinion amongst the groups.

Standard statistical tools like t-test, one-way analysis of variance (ANOVA) are applied to analyse the surveyed data. Apart from these, multivariate regression analysis was also performed to more thoroughly test the hypotheses and to predict few models based on the variables selected. Clustering of case study projects and the performance parameters were also undertaken based on performance ratings by the respondents. However, as per the scope of this paper, only a portion of the analysis relating to identification of the critical risk and establishing of study hypotheses have been discussed.

Category	Promoter	Govt	Consultant	Lender	Others
Promoter	1				
Govt	0.821**	1			
Consultant	0.826**	0.843**	1		
Lender	0.866**	0.895**	0.921**	1	
Others	0.489*	0.688**	0.623**	0.640**	1
** Correlation is significant at the 0.01 level (2-tailed)					
* Correlation is significant at the 0.05 level (2-tailed)					

Table 4: Correlation among category of respondents for risk issues in taking up PPP Projects in India.

4.1. Categories of Risk for PPP infrastructure Projects

Risk can be classified on basis of allocation or mitigation strategy in an infrastructure project. Thus there are:

- *Transferrable* risks, i.e., risks fully transferrable to the private sector.
- *Retained* risks, i.e., risks for which the government bears the costs, e.g., the risk of delay in gaining project approvals.
- *Shared* risks, i.e., risks that are shared based on a combination of the above two allocations due to the nature of the risk.

There may be different view of perception level of the stack holders for the Risk involved in a PPP project. Thus Risk could be viewed from the concessionaire's view point as an opportunity in bidding phase and as hazard or threat in the implementation phase. However, there is not much scope of upside gain in PPP project other than what had been negotiated and agreed upon in the concession. Few important terms associated with project risk evaluations are:

4.1.1. Risk Event

It is a specific event that could occur during the project life cycle, which has a probability of occurrence and generally an adverse impact on the project objectives. The key attributes of risk events are the probability of occurrence and the impact of occurrence.

4.1.2. Risk Factor

Factor which could lead to the occurrence of one or more risk events and is characterized by the probability of occurrence. Risk factors do not affect project objectives directly but do so through risk events (indirect impact). Risk events are triggered by risk factors (Tah and Carr, 2000, Thomas A.V.,2002).

4.1.3. Risk Criticality

Risk criticality is defined as the combined effect of the probability of occurrence and the impact of a risk event or a risk factor.

4.1.4. Risk Activities

These are the events happenings of which lead to risk.

4.1.5. Risk Allocation Matrix

Risk Allocation Matrix is only a tool to help understand the principles regarding risk allocation. For each project, the actual risk allocation will need to consider the principles of allocation and the circumstances of the deal.

4.2. Risk Identification Process

The preliminary list of various risks, risk events and risk factors falling under a category, associated with PPP projects in general and unique to the Indian project environment were prepared based on desk based literature review and discussions with the locally available project participants and were included in questionnaires for survey stage-1. At the risk identification stage, both "risk events" and "risk factors" falling under a particular risk category are treated as "risk factors" (Salzmann and Mohammed, 1999, Thomas, 2002) and were separated subsequently for risk analysis purposes. Thus for the study assumptions, while 'availability of land' is a risk issue, 'delay in land acquisition' is the factor which triggers the risk of availability of land to a project. Similarly, 'obtaining debt financing' is an issue, while 'debt service repayment' is the factor.

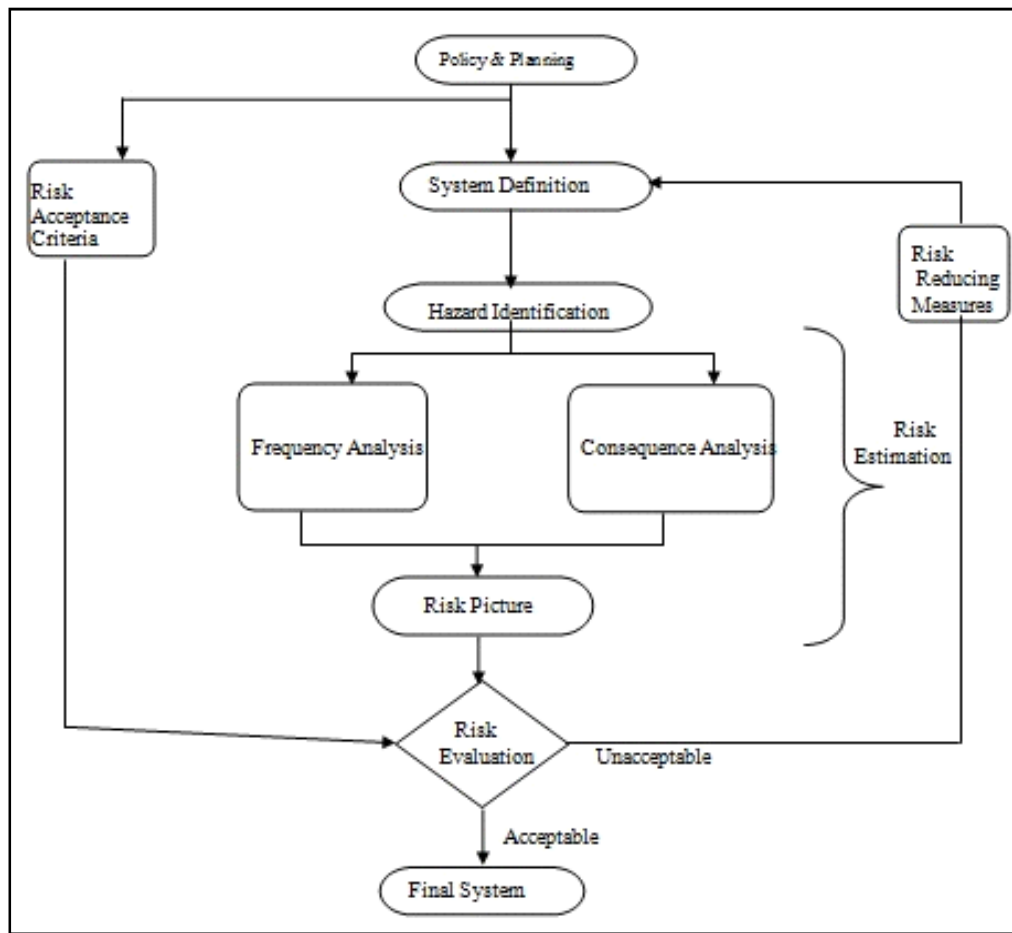


Figure 2: Risk Assessment & Management Flowchart
 (Source: Bridge Engineering Handbook, CRC Press, Edited by W. F. Chen & L. Duan)

4.2.1. Identification of Critical Risk issues and Factors and Discussions thereon

The index developed by Wang *et. al.* (2000) was used for measuring risk criticality for the present study.

$$\text{Criticality index} = \frac{5n_1 + 4n_2 + 3n_3 + 2n_4 + n_5}{5(n_1 + n_2 + n_3 + n_4 + n_5)}$$

Where n_1 = number of respondents who answered “Most Critical”: n_2 = number of respondents who answered “Very Critical”: n_3 = number of respondent who answered “Critical”: n_4 = number of respondents who answered “Some What Critical”: and n_5 = number of respondents who answered “Not Critical”. In the present survey, the importance preference has been converted to criticality in the same manner as the same ordinal (5-point Likert scale) has been used to measure all the parameters. Criticality classification is again made with index values in Table 6 as was done by Wang (2000), Thomas (2002).

Risk Criticality	Criteria
Not Critical	Criticality index ≤ 0.50
Critical	Criticality index > 0.5 to ≤ 0.7
Very Critical	Criticality index > 0.7 to ≤ 0.9
Most Critical	Criticality index > 0.9

Table 5: Risk Criticality Classification

Based on the survey responses and compilation of data following 12 (twelve) Most Critical Risk issues for Indian infrastructure PPP projects have been identified.

Identified Most Critical Risk issues	Evaluated Criticality Index
• Availability of land	0.980
• Commercial justification	0.975
• Obtaining of Debt Financing	0.950
• Resettlement and Rehabilitation	0.940
• Socio Political Issues	0.930
• Revenue Collection	0.925
• Equity Requirement	0.920
• Legal Issue	0.910
• Type of Tolling	0.910
• Technical & Financial capability (of promoter)	0.910
• Environmental Issue	0.905
• Quality and safety standards	0.900

Table 6

Compiling the responses from the promoter, consultant, government representatives, lenders and other categories and adopting the same procedure to evaluate Criticality indices as for the risk issue gives us following 10 (Ten) Most Critical and Very Critical Risk factors are:

Identified Most Critical Risk Factors	Evaluated Criticality Index
• Revenue Generation	0.990
• Demand Risk	0.980
• Financial Risk	0.975
• Delay in Land Acquisition	0.970
• Debt Servicing Repayment	0.970
• Delay in Financial Clouser	0.950
• Geographical /location risk	0.940
• O& M Risk	0.940
• Resettlement & Rehabilitation	0.910
• Completion Risk	0.900

Table 7

Identified Very Critical Risk Factors	Evaluated Criticality Index
• Direct Political Risk	0.890
• Other pre-constructional activities risk	0.890
• Legal Risk	0.870
• Environmental Risk	0.870
• Cost overrun	0.860
• Indirect political risk	0.830
• Technological risk	0.820
• Partnering and Joint venture risk	0.790
• Design and latent defect risk	0.790
• Regulatory risk	0.770

Table 8

The findings of the study are consistent with some findings by researcher like Gupta A. K. *et al.* (2013), Mane and Pimplikar (2013), Maniar H. (2010). However, it would be interesting to see from the tables that the perception level towards a particular risk by all the respondent categories are not same, even though overall perceptions does not differ in a significant way. Thus, the land acquisition risk as per promoter ranked 5, whereas as per Govt. ranked at 7 and as per consultant it stood at 5. However, as per the lenders and other categories, it ranked at No. 1 and 2 respectively. Similar, variation of perceptions of respondent categories are noticed in case of few other risk factors. One of the reason behind this difference in perceptions is that each category of respondent has got his own set of interest in a PPP project (being a stack holder) and looks into an issue through his own interest angle. Differences in perception level of different categories of respondents have been well explained by researcher & persons like Thomas A. V. (2002), Gupta D. P. (2010).

The natures of the identified most critical risks are described in brief here under:

4.2.1.1. Demand/Revenue Generation Risk:

The demand risk is defined as fluctuation of users associated with introduction of toll, market changes and the level of service provided. Delhi Noida Bridge, Ahmedabad Vadodara Toll Road and even in Delhi Gurgaon Expressway project, problems cropped up because of inaccuracy of demand projection.

4.2.1.2. Financial Risks:

In Indian context, most of the promoters are not in a position to mobilize money from their current balance sheets and are primarily relying on project financing. Since the revenue from projects is in local currency, it is not sustainable to repay foreign investment (debt or equity) from domestic revenue for a long run. Secondly, the Indian promoter are more dependent on the commercial bank rather than to borrow from institutional financier. As a result, there is always a chance of asset liability miss-match in case of long term projects like PPP. In India, projects like Cochin International Airport, Delhi Noida Toll Bridge, Vadodara Halol Toll Road etc. suffered severely from Financial Risk at different stage of the project operation.

4.2.1.3. Delay in Land Acquisition and Resettlement and Rehabilitation Risks:

Delay in survey, notification and acquisition process, politically motivated public resistance, non-availability of alternate land at reasonable cost, political patronage for encroaches, resettlement and rehabilitation problems, litigations and court proceedings can often lead to long delay in land acquisition (*Srinivasan, 2000; Ramesh, 1999, Thomas, 2002*). The primary reason for certain segments of the GQ phase of the NHDP exceeding the project completion deadline had been due to problems in land acquisition (*Gupta A.K., 2013*).

4.2.1.4. Debt Servicing Risk:

The cash flow inadequacy for repayment of debt component could be a serious problem for PPP projects during the operation phase of the project lifecycle. Though provision for moratorium on principal repayment is available in many projects, the high interest rate coupled with low realization revenue generation during the initial operation phase may increase the chances of debt servicing risk. Both promoters and lenders are therefore remains concerned with this risk. Vadodara Halol Toll Road suffered from Debt Servicing risk severely.

4.2.1.5. Delay in Financial Closure:

This refers to inability for timely (before the appointed date) arranging of necessary debt and equity finance for the PPP project. Generally, PPP projects require huge capital investment upfront and the major portion of the resources are to be arranged through non-recourse type of project financing. Promoters of Indian projects are frequently medium sized contracting companies, which themselves are not well capitalized. Availability of long-term financing for infrastructure projects is very limited in India. The Indian capital market is also not matured for this type of financing (*Harris C., 2008*). The Cochin International Airport project got stuck up in its initial phase due to delay in financial closure.

4.2.1.6. Geographical and Location Risk:

This risk refers to the problem arising out of Geographical location of the project. Not all locations in India are equally conducive for project development. The socio political cultures of many states differ in themselves and do not provide the same type of environment for a PPP project development. Thus, a project development environment in western India is not same with the eastern side of the country. Moreover, there are practical difficulties like availability of needful resources as well as generation of demands. The regional distributions of PPP projects in India are presented earlier by Priya M. S. and Jesintha P. (2011). Due to this geographical disparity Govt. of India had to adopt policies like SARDP-NE for developments in remote North Eastern area.

4.2.1.7. Operation and Maintenance Risks:

Unexpected maintenance of the infrastructure facility, poor experience, user's problems, accidents, overloading, public agitation, failure of associated infrastructure and parallel developments are some of the reasons for the subject risk. Feedback from promoters revealed that in many national highway projects, the state support agreement signed between central, state and the promoter for smooth operation of toll road is not proving adequate with frequent violations. Coimbatore Bypass project got jeopardized in absence of a proper state support.

It is also reported that PPP projects present a different risk profile than conventional projects. Many of the risks in a PPP project come from the complexity of the arrangement itself in terms of documentation, financing, taxation, technical details, sub agreements, and market conditions (*Gupta A. K. et. al., 2013*).

The DMRC Airport line (Third phase of DMRC) project, Modern Bus Terminus at Amritsar also entangled problems in the operational phase.

4.2.1.8. Resettlement and Rehabilitation Risk:

Traditionally resettlement and rehabilitation was done by Govt./ the public agencies. However, in PPP project environment rehabilitation of displaced habitations are undertaken by promoter in the interest of early settlements. Due to public resentment of rehabilitation measures risk may crop up and even jeopardize the whole project purpose. Some of the projects where huge resettlement and rehabilitation issues had cropped up were Coimbatore Bypass, Cochin International Airport, East-West Corridor of Kolkata Metro.

4.2.1.9. Completion Risk:

These are the risks in which the project may not be completed on time & may also exceed its sanctioned cost. The reasons behind, may be design and latent defect, and technology failure, procurement and execution problems, financial issues. This risk is also influenced by other risks such as delay in land acquisition and delay in financial closure etc. These come under Construction phase risks of a project and are well documented in the literature (*Baldwin, 1971, Erikson, 1979; Perry and Hayes, 1985; Al-Bahar, 1989; Smith and Bohn, 1999, Akintoye, 2001, Thomas 2002, Gupta 2013*). Integrated SWM project of Guwahati, Ahmedabad Vododora Expressway, Delhi Metro Airport line were few example of adverse effect of project delays.

The natures of some of the identified very critical risk are:

4.2.1.10. Direct and Indirect Political Risks:

Since investments in PPP infrastructure are long-term, irreversible and domestic market dependent, changes in the government policies adversely affect the profitability. They affect all aspects of a project, from site selection and construction through completion, operations and marketing. They are difficult to evaluate. Wherever possible, these risks are assumed by sponsors. Where this is not possible, lenders sometimes assume such risks. The ultimate political risk is expatriation. It is often difficult to distinct this risk from country risk. (*Manir H.,2011*) Coimbatore Bypass and Delhi Noida Bridge project finances got affected due to political risk.

4.2.1.11. Other Pre-constructional Activities:

In India, prior to the start of construction of a PPP project, be it road or in any other sector, multi-level permits (central, state and local) and approvals are to be obtained from various authorities. Though, government facilitates in obtaining such permits/approvals, there have been reported inordinate delays. Secondly, utility shifting, which are not generally part of the host department, takes lot of time due to lack of co-operation and co-ordination between Government agencies. Permit/approval delay is one of the prime causes for time overrun of projects in India. A report by the Times group highlighted that government projects worth `7 Lakh crores were stuck up due to government red tapes and at least 37 projects in Power sector had been delayed due to want of environmental clearances (*Sidhartha, Mar,2013*). People are therefore advocating 'Single Window' clearances for project developments.

4.2.1.12. Legal Risks:

This risk arises out of the complexity in the legal front under which the projects are being executed. For example, in India, there are about thirty-five laws that have a direct or indirect bearing on private road projects only. Tolls Act (1851), The National Highway Act (1956), National Highway Authority of India Act (1988), Land Acquisition Act (1894) and Arbitration and Conciliation Act (1940) are some of the important acts referred in road projects and have been amended to facilitate private investment in the sector. Due to tedious and lengthy process of legal dispute settlements, these risks generally crop up. Gurgaon Delhi Expressway, Delhi Metro Airport line (DMRC Third Ph), Coimbatore Bypass etc. were some of the projects entangled by legal hurdles.

4.2.1.13. Environmental Risk:

Fault in conducting Environmental Impact study (EIA), not adequately consulting the affected parties may result in cropping up of public resentment against a project. There have been lot of examples particularly in Energy and Power sector infrastructure projects. Lower Shobonsiri Project in North East is a golden example though it is not in PPP mode. Similarly, delay in getting environmental clearance and pollution issues may impact performance of the project. There should be an effective R&R policy for social and environmental impact assessment and findings of such assessments should be discussed in public with affected stakeholders. Integrated SWM Guwahati is a classical example, still facing environmental hurdles.

4.2.1.14. Cost Overrun:

Over exceeding of budgetary amount causes this risk. This may be because of unexpected additional works, repetition of work due to faults, other causes of delay in completion leading to cost escalations, faulty financial structure of the project, malpractices etc. Delhi Noida Bridge project requiring financial restructuring was a classic example of cost overrun.

4.2.1.15. Partnering & JV Risk:

Most of the BOT road projects are undertaken on a consortium approach. Thus, team spirit and mutual trust among the partners are essential characteristics of a consortium. Organizational structure with well-defined areas of functioning is necessary to avoid conflict among various groups. Project risk may be aggravated by the inadequate performance of individuals and organizations contributing to the project. It has been reported that international joint ventures are subject to very high rate of failure due to cultural and operational difficulties at both national and organizational level (*Shridharan, 1997; Thomas, 2002*). Dispute in Gurgaon Delhi Expressway is an example for partnering and JV issue.

4.2.1.16. Regulatory Risks:

Generally, regulators are ought to be nonbiased bodies formed with representatives of all sides and highly experienced people in the field. These bodies are entrusted with legal powers and rules & provisions to deal with most of the kind of criticalities and eventualities in that particular field. Thus, they can take swift decisions on tariff changes to dispute among stack holders. Overall, they control the project rules and regulations on that particular field. In India, so far all sectors do not have uniform regulators and in some

ministries the organizational head has been entrusted to function as a regulator. In those type of cases, a nonbiased decision as needed in a private participating environment cannot be guaranteed. The need for regulators is strongly highlighted by researcher like Gupta A. K. (2013). Absence of regulators had hindered interest of otherwise successful projects like Delhi Gurgaon Expressway, DMRC Airport Line etc.

4.2.1.17. Technological /Design & Latent Defect Risk:

These may result in repetition of work, suspension of work or just even price escalation due to change in specifications. Thereby, it may cause delay in completion or simply cost escalations without delay too. Nellore Bypass is such an example, wherein design clearance of a Railway Over Bridge & 17 new culverts escalated the cost in a multiple way.

4.2.2. Classifications of Risks into different Phases of the Project:

The identified risk is classified into different phases of project development as was done by people like Tiong (1990), Beidleman’s (1990), Arndt and Maguire (1999) and Thomas A. V. (2002). Thus we have risk falling under following different phases as follows:

Code	Project Phase	Risk Category
DEV	Developmental Phase	Resettlement and rehabilitation risk, Other Pre Constructional activities risk, Delay in financial closure, Political risk (direct & indirect), Environmental risk, Partnering & JV risk, Delay in land acquisition
CNC	Construction Phase	Technology risk, Design and latent defect risk, Completion risk and Cost overrun risk, Delay in land acquisition, Political risk (direct & indirect), Environmental risk, Legal risk, Financial risk, Geographical/Location risk, Partnering & JV risk
ONM	Operation Phase	Demand/ revenue risk, Operation risk, Debt servicing risk, Political risk (direct & indirect), Regulatory risk, Environmental risk, Design and latent defect risk, Partnering & JV risk, Legal risk, Financial risk, Cost overrun risk, Geographical/Location risk

Table 9: Classification of Risks in Indian PPP Projects

Figure -3: shows the variations in criticality of some of identified risk factors in different phases of project life cycle based on responses first stage survey.

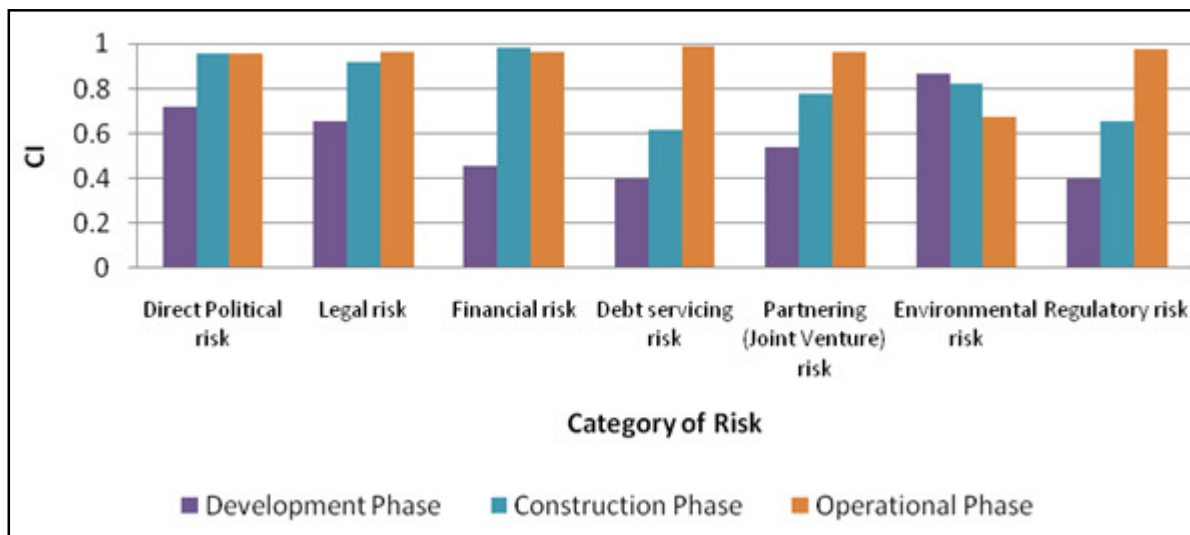


Figure 3: Variation of Criticality of Some of the identified risks in different phases of Project

It could be seen that while the Environmental risk goes on decreasing from developmental to O&M phase, the Debt servicing risk, regulatory risk is making an increasing trend from Developmental to O&M phase. Construction phase pose to be very vulnerable as all the risks in that phase crosses the criticality threshold. This strengthen the Akintoye’s (2003) statement that construction is the most vulnerable-endeavourer. It is inferred that at different phases of PPP project critical risk factors of that phase have to be given priority for management of overall scenario. Thus, while at developmental phase one has to be more careful about the ‘Environmental issues’, ‘Legal issues’ as well as ‘Political issues’. In the construction phase, ‘Financial risk’, ‘political risk’ and ‘Physical risk’ need to be given priority. However, in O&M phase, ‘Debt Service risk’, ‘Regulatory risk’, ‘Financial risk’ are required to be managed effectively.

4.2.3. Allocation of Risk

One of the primary features of PPP project is risk sharing and its allocation to the party best suited to manage the same. Therefore, it was also intended by the author to get an idea of risk allocation preferences of different categories of respondents and accordingly questionnaires have been put in the first stage questionnaires. The responses to this has been compiled and presented in Table10 It can

be seen from the table that for Delay in Financial Closure & Financial risk, the preference of allocation goes to Govt., Promoter and Lender. Similarly, for Debt servicing and legal risk, the preferences were for Promoter, Govt, Lender and Insurer. All other risk preferences went either towards Govt. or to Promoter, except in case of demand risk a small percentage felt for allocating towards user. However, in case of primary allocation of risks (assuming more 30% combined preferences as per *Thomas A.V.,2002*), all the risk is allocated either to Govt. or to Promoter as per their managing ability of that particular risk category. Thus, on primary allocation Land Acquisition risk went to Govt., while Resettlement & rehabilitation, Political risk, Geographical/Location risk went to both Govt. & Promoter. Thus we have

- 23 Risk parameters identified by the respondents who had reasonable years of experiences in managing risk and dealing with PPP projects. Out of these 11 risk were correctly allocated to the party best capable of managing it. In case of 12 risk categories, there has been mismatch and risk are not correctly allocated.
- In 15 risk categories, Govt. is the one of the most capable parties, but their participation mostly seen in only 6 categories, non-crucial in 9 categories of risk.
- Promoters appears to be best party to manage risk, followed by Govt. The role of lenders is expected in certain categories like Financial Clouser, Debt Servicing Risk, Financial Risk, Cost Overrun etc., but in practice lenders have hardly taken any role in managing risk. Similar is the case for insurers.

The basic reasons for allocating most of the primary allocation to the promoter is that unlike in a conventional or 'EPC' project, where government or the host department principally controls and manage the funds for the project and remains concerned for the same, in case of PPP the fund management principally rest with the promoter and eventually he become more concerned on return of his investments. So, at all times his/her primary goal is to get into a fast track project development route even if by sharing little more responsibility to get back his assured return at the appropriate time. The other stack holders just facilitate in easy discharge of his/her (promoter's) responsibilities.

Sl. No.	Project Risk	Parties suitable for management of the risk	Risk primarily allocated to the party	Mismatch if any with primary allocation & Parties suitable for managing the risk
A	Pre investment risk	GOV, PRO	GOV, PRO	No
B	Delay in financial closure risk	GOV, PRO, LEN	PRO	Yes
C	Resettlement & rehabilitation	GOV, PRO	GOV, PRO	No
D	Delay in land acquisition	GOV, PRO	GOV	Yes
E	Other Pre-constructional activities risk (Permit/approval/utility shifting)	GOV, PRO	PRO	Yes
F	Technological risk	PRO	PRO	No
G	Design & latent defect risk	GOV, PRO	PRO	Yes
H	Cost overrun risk	GOV, PRO, LEN, INSU	PRO	Yes
I	Completion risk (time overrun)	PRO	PRO	No
J	Demand risk	GOV, PRO, USER	PRO	Yes
K	Revenue generation risk	GOV, PRO	PRO	Yes
L	Operational & maintenance risk	PRO	PRO	No
M	Direct political risk	GOV, PRO	GOV, PRO	No
N	Indirect political risk	PRO	PRO	No
O	Regulatory risk	PRO, GOV	PRO, GOV	No
P	Legal risk	GOV, PRO, INSU	PRO	Yes
Q	Debt servicing risk	GOV, PRO, LEN, INSU	PRO	Yes
R	Financial risks	GOV, PRO, LEN, INSU	PRO	Yes
S	Nonpolitical force majeure risk	PRO	PRO	No
T	Partnering (joint venture) risk	PRO	PRO	No
U	Environmental risk	GOV, PRO	PRO	Yes
V	Physical risk	PRO	PRO	No
W	Geographical / Locational risk	GOV, PRO	GOV, PRO	No
X	Others if any:			
GOV: Govt. PRO: Promoter LEN: Lender INSU: Insurer				

Table 10: Allocation of Risk to party capable of managing the risk/Best capable to manage the risk.

4.2.4. Perceptions on few important Aspects of Indian PPP Environment:

It was also intended in the research to look into the type of perception on some important aspects relating to PPP environment India. Thus, in the first stage of the questionnaires questions relating to adequacy of Government effort, adequacy of feasibility study, preference regarding return/ tolling method, risk allocation and management approach etc. were included. All responses were to be provided on the 5-point Likert scale as stated earlier. The compiled responses were further subjected to statistical t-test and Analysis of Variance (ANOVA), wherever applicable/necessary for determining if there exist any significance differences.

The study results as presented in Table 11 has revealed that improper feasibility studies are also responsible for high demand risk. All respondents in different categories of stockholders express the concern for inadequate feasibility studies. However, there is difference of perception with regard to responses of Govt., Consultant and Promoters and other categories as because the Govt. themselves sponsors the feasibility studies and some of the counterparts of the Consultant fraternity carry out the feasibility studies. Promoters and ‘Other’ feels that there are lot of variations in ‘accuracy of traffic count’ resulting changes in works scopes’.

Category of respondents	No. of Respondents	Adequacy of feasibility Study		Hypothesis H ₀ : Mean=3.00		Remarks	Comment
		Mean	SD	t-value	Significance (2-tailed)		
Govt.	10	3.000	0.667	0.000	1.000	NS	NANA
Promoter	25	2.240	0.436	2.753	0.011	**	D
Consultant	12	3.167	0.577	1.000	0.339	NS	NANA
Lender	8	2.875	0.641	-0.552	0.598	NS	NANA
Others	7	2.429	0.535	2.121	0.078	NS	D
Combined	62	2.645	0.392	-7.127	0.000	**	NANA
** Significant at 5% level (H ₀ rejected)				NS: Not significant at 5% level			
A: Agree NAND: Neither Agree nor Disagree D: Disagree							

Table 11: Responses regarding adequacy of feasibility study

4.2.5. Adequacy of Govt. Efforts towards good PPP environment:

Table 12 presents responses towards adequacy of Government efforts for making conducive atmospheres of PPP environment. Figure 4 presents the same in graphical form. While all the Govt. respondents as expected opined that governmental efforts towards good PPP environment is adequate, 36% of promoters, 33% of consultant, 37.5% of lenders and around 43% of ‘others’ felt that the efforts are not adequate. Overall 69.35% of respondents felt adequate.

Category of Respondents	Number of respondent and % thereof.	
	Adequate	Inadequate
Govt.	10 (100%)	0 (.0%)
Promoter	16 (64%)	9 (36%)
Consultant	8 (66.67%)	4 (33.33%)
Lenders	5 (62.50%)	3 (37.50%)
Others	4 (57.14%)	3 (42.86%)
Total	51 (69.35%)	11 (30.65%)

Table 12: Response for Adequacy of Govt. Efforts towards good PPP environment

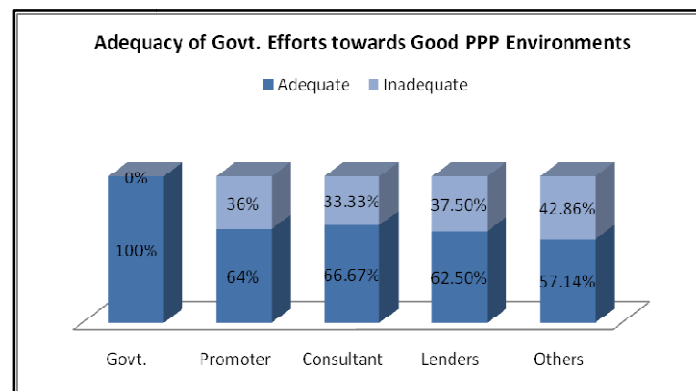


Figure 4: Responses towards adequacy of Government efforts for good PPP Environment.

4.2.6. Preference among stack holders for the type of concession mode:

Table 13 shows the responses of the respondents towards the type of concession mode for Indian infrastructure development projects vis. a vis. the return method. Figure 5 shows the graphical representation for combined response for the return method. As in Table 13, around 63% of the overall respondents prefer for a ‘Fixed period + Fixed return method’. This is because in case of a fixed period, the responsibility or the liabilities and obligations of the parties remained fixed to that specific period only and beyond that he/she does not want to share any more burdens be it operational, financial or technical. By ‘fixed return’ the party wants to get assured about the return of his income. It is interesting to see the difference of opinions by Govt. and the Promoter categories as per their own business interest

Category of Respondents	Fixed return	Fixed period	Fixed period+ Fixed return	Total
Govt.	0	8	2	10
Promoter	2	0	23	25
Consultant	1	6	5	12
Lender	2	1	5	8
Others	0	3	4	7
Total	5 (8.10%)	18 (29.0%)	39 (62.9%)	62 (100%)

Table 13: Return method preference among the respondents

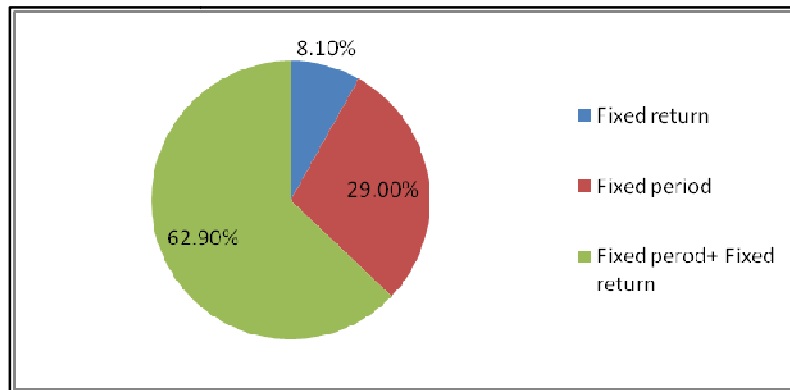


Figure 5: Combined preferences of all categories of respondents for Return method

The responses for tolling method preference have been presented in Table 14. Figure 6 shows the graphical representation of combined preference for tolling. It could be seen from the table that the ‘Annuity payment’ is the most preferred tolling method (53.2% of respondents) followed by ‘Direct tolling’. As stated earlier ‘Annuity method’ is a traffic revenue risk neutral model and hence most of the promoters preferred the same. Secondly, in case of Annuity payment, both the return terms as well as the amount are fixed i.e. it falls in ‘fixed return + fixed period’ category. ‘Direct tolling’ is preferred by around 42% respondents and as can be seen lenders are more interested in ‘direct tolling’ because of the high profitability in viable projects. ‘Shadow tolling’ though preferred by a few Govt. respondents, does not have much acceptability as the mechanism for the same requires legislative policies and lot of political & other issues gets involved. Singh *et al.* (2006) has advocated for the ‘traffic revenue risk neutral model’ of Annuity payment in BOT/PPP projects.

Category of Respondents	Direct tolling	Shadow tolling	Annuity payment	Total
Govt.	5	2	3	10
Promoter	4	0	21	25
Consultant	6	1	5	12
Lender	6	0	2	8
Others	5	0	2	7
Total	26 (41.94%)	3 (4.84%)	33 (53.22%)	62 (100%)

Table 14: Tolling method preference among the respondents

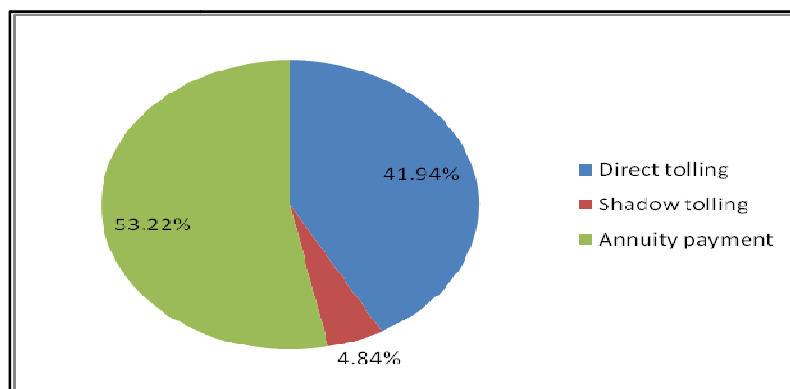


Figure 6: Combined preferences of all category of respondent for Tolling Method

4.2.7. Preferred Risk allocation and Management approach:

In response to questionnaires of first stage of survey, the different categories of respondent as per Table 15 have chosen ‘the entrenchment of right’ as the most preferred method of risk management. Further, in case of ‘Material Adverse Effect’, they have chosen the alternative as per Table 16 even though as per survey result MAE itself is the least preferred risk allocation/ management approach.

Category of Respondent	The entrenchment of right	Material Adverse Effect (MAE)	Negotiate at the time of risk realization	Total
Govt.	10	0	0	10
Promoter	12	1	12	25
Consultant	11	0	1	12
Lender	7	0	1	8
Other	6	1	0	7
Total (%)	46 (74.19%)	2 (3.22%)	14 (22.58%)	62 (100%)

Table 15: Response of Preference for Risk allocation and Management approach

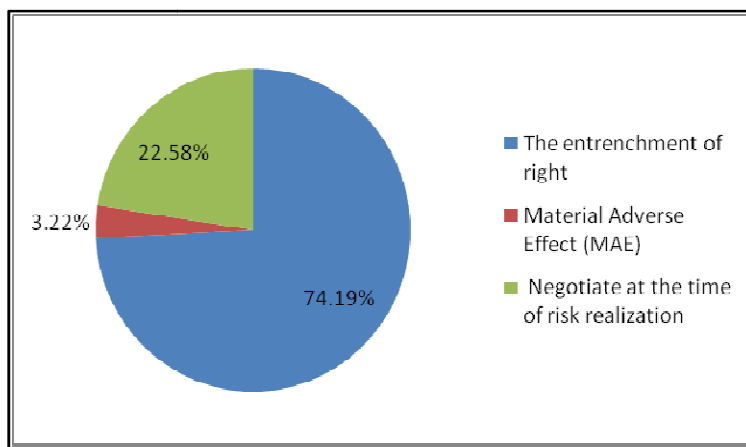


Figure 7: Combined responses of all categories for preference of risk allocation and Management

Category of Respondent	Toll charge adjustments	Varying the concession	Direct financial contribution	Reallocation	other method	Total
Govt.	1	5	3	0	1	10
Promoter	7	9	6	0	3	25
Consultant	7	3	0	0	2	12
Lender	1	6	0	0	1	8
Other	0	4	0	3	0	7
Total (%)	16 (25.80%)	27 (43.55%)	9 (14.52%)	3 (4.84%)	7 (11.29%)	62 (100%)

Table 16: Alternative tolling preference in case of MAE

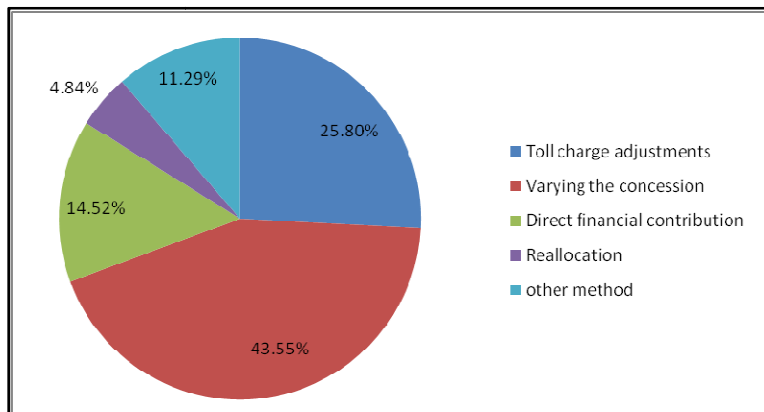


Figure 8: Combined response of all categories for Tolling preferences in case of MAE

Primarily, MAE is an approach in which risk are readdressed on the effect of their actual crystallization circumstances. A total of 43.55% of the respondent preferred 'Varying concession' option, followed by around 26% for 'Toll charge adjustment'. The entrenchment of right approach, on the other hand, allocates risk and obligation clearly to one party.

4.2.8. Responses towards type of Govt. Support:

Responses regarding preferences for type of government support were also sought in first stage survey. The compilation collected data (presented at Table 17) shows that in order of combined ranking 'Tax relief' gets the first preference followed by 'Land purchase clearances' and 'Complementary investment / other development' rights. For PPP project development environments most of the promoters as well as rest of the respondents want to get rid of the heavy burdens of various statutory taxes to maximize their net earnings. At the same time, everybody wants to settle at the very outset the most critical issue of 'land purchases'. Thirdly, even if some shortfall of revenue occurs through the normal route, 'the complementary investment route' is open for him to meet up the shortfall and in normal cases to earn an extra bonus out of it.

Factors	Govt.		Promoter		Consultant		Lender		Others		Combined		Rank
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Form of government support you would prefer in a PPP/BOT project													
Guarantee (s)	4.40	0.52	4.36	0.64	4.92	0.29	4.50	0.76	4.00	0.58	4.45	0.56	4
Cash Subsidy	3.00	0.47	3.56	0.77	3.17	0.39	3.75	1.04	3.86	0.90	3.45	0.71	7
Equity Participation/ Grant	3.70	0.67	4.96	0.20	4.50	0.52	4.50	0.53	4.00	0.58	4.50	0.50	5
Subordinated debt	3.70	0.67	4.44	0.58	4.33	0.49	4.38	0.52	3.29	0.49	4.16	0.55	6
Complementary investments (feeder roads/other developmental rights)	3.90	0.88	4.8	0.41	5.00	0.00	4.88	0.35	4.43	0.98	4.66	0.52	3
Tax relief	4.80	0.42	4.96	0.20	5.00	0.00	5.00	0.00	4.71	0.49	4.92	0.22	1
Land purchase and clearance	4.60	0.70	4.72	0.46	5.00	0.00	4.88	0.35	4.71	0.76	4.774	0.45	2

Table 17: Preference on type of Govt. supports

4.2.9. Responses of Agreement with the Important PPP Bidding & Negotiation Issues

The response regarding few important bidding and negotiation related issues were also sought and are presented in Table 18. It reveals that on 'bargaining power to pass on risk to the other parties', all categories of respondent agree. However, on the issue of 'in sufficiency of information and time' government's representative responses differ. The promoter category agrees to the issue, while consultant, lenders and others plays a neutral role. Similarly, in case of the issue of 'analyzing of risks for the PPP launching of tenders' Govt. respondents disagreed with the fact that these were launched before analyzing the risk. However, Lenders agreed to it. The others said, "Neither Agree nor Disagree". Therefore, a clear perception difference of the stack holders as per their own business interest has been reflected in the results/responses.

Sl No.	Issues	Category	No	Agreement with the issue		t-value	Sig. (2 tailed)	Remarks	Comment
				Mean	SD				
1	PPP participants use bargaining power to pass as many risks as possible to other parties. (rather than retaining the risks which they can manage)	Govt.	10	4.0	0.00	-			A
		Promoter	25	4.2	0.37	2.14	0.04	**	A
		Consultant	12	4.3	0.45	1.91	0.08	NS	A
		Lender	8	4.0	0.00	-			A
		Others	7	4.1	0.38	1.00	0.36	NS	A
		Combined	62	4.1	0.28	3.61	0.00	**	A
2	During bidding, the information and time available is insufficient to fully analyze and cost the risk in PPP/BOT Projects	Govt.	10	2.3	0.48	1.96	0.08	NS	D
		Promoter	25	3.6	0.70	4.57	0.00	**	A
		Consultant	12	3.3	0.45	1.91	0.08	NS	NAND
		Lender	8	3.3	0.46	1.53	0.17	NS	NAND
		Others	7	3.0	1.15	-2.29	0.06	NS	NAND
		Combined	62	3.2	0.64	2.79	0.01	**	NAND
3	The tender for large PPP projects are often launched before fully analyzing the risks and their optimum allocation parameters.	Govt.	10	2.0	0.00	-			D
		Promoter	25	3.5	0.51	4.71	0.00	**	NAND
		Consultant	12	2.9	0.51	-0.56	0.59	NS	NAND
		Lender	8	3.5	0.53	2.65	0.03	**	A
		Others	7	2.9	0.69	-0.55	0.60	NS	NAND
		Combined	62	3.1	0.45	1.12	0.27	NS	NAND
**Significant at 5% level (H_0 rejected)				NS: Not Significant at 5% level					
A: Agree NAND: Neither Agree nor Disagree				D: Disagree					

Table 18: Responses showing agreement with the important PPP bidding & negotiation issues

4.2.10. Response towards some of the Perceived Deficiencies in Project Development efforts in India

Responses towards some of the perceived deficiencies of Indian PPP environment have been compiled and presented in Table 19. From this table and Figure 9, it has been revealed that absence of efficient project management (responses of 66%), corruption & malpractices (responses of 63%), Selection of right type of agencies (56.5% response), lack of strict enforcement measures (56.4% responses) and non-availability of regulatory authority (53% responses) are major perceived deficiencies in case of project development efforts by the government. Some of these are also supported with the findings of Gupta *et. al.* (2013). Therefore, for the better PPP project development efforts the said aspects need to be addressed pro-actively in India.

Details of deficiencies Perceived	Percentage of Respondents						Rank
	Govt.	Promoter	Consultant	Lender	Others	Combined	
Non availability of Regulatory authority in each & every sector	20.00%	80.00%	42.00%	25.00%	57.14%	53.29%	5
Lack of strict enforcement measures	20.00%	80.00%	41.66%	37.50%	71.42%	56.45%	4
Frequent changes in political establishments	20.00%	76.00%	33.33%	37.50%	42.85%	49.99%	6
Selection of right type of agencies	40.00%	64.00%	42.00%	62.50%	71.42%	56.51%	3
Volatility of Indian market especially during recession period	10.00%	72.00%	33.33%	50.00%	42.85%	48.39%	7
Absence of efficient Project Management for dealing critical issues	30.00%	88.00%	42.00%	62.50%	85.71%	66.19%	1
Corruptions/Malpractices	40.00%	80.00%	42.00%	62.50%	71.42%	62.97%	2
Force Majeure/ Natural calamities	20.00%	68.00%	33.33%	37.50%	42.85%	46.77%	8
JV issues	20.00%	64.00%	25.00%	25.00%	57.14%	43.54%	9

Table 19: Some of the perceived Deficiencies in Project Development Efforts in India

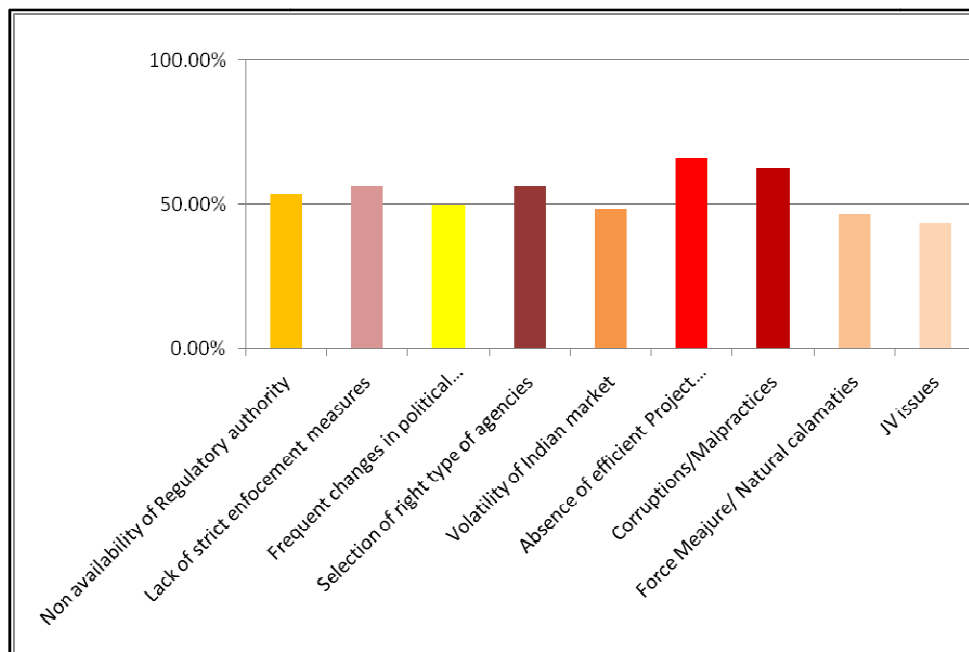


Figure 9: Percentages of total respondents for issue wise Perceived Project Development Deficiency

4.3.0 Evaluation of Risk Impact Criticality and test for hypotheses

Through the second stage of survey responses Risk Impact Criticality (RIC) of various risk occurring in Developmental phase, Construction phase and O & M phase have been evaluated. In the survey questionnaires were again in 5-point Likert scale. To measure the responses, two questions were put to collect information for every risk aspect. They were designed in such a way that the response to first one reflects the occurrence of the event and the second one gives the importance of impact. So, the product of both the responses would ultimately lead for giving Risk Impact Criticality (RIC) value. Further, it could be seen from the Table 20 to Table 25 that if both 'Occurrence' and 'Importance' of a particular risk category becomes high, then only the corresponding risk impact would be high. If either 'Occurrence' is low or 'Importance' is low the impact also gets lower.

RIC for Cost-Benefit Analysis which is an integral part of Pre-Project Development have also been evaluated through second stage survey responses as well as RIC in case of Legal risk and Regulatory risk.

For computation purposes the mean, the standard deviation and Risk Impact Criticality index for each risk based on the responses by the Government representatives, promoters, lenders, consultants and other categories of respondents were evaluated. One-way

ANOVA F-test (2-tailed) carried out for each risk showed that there is a high degree of agreement in responses (at 0.05 significance level) for all the risks barring few exceptions.

4.3.1. Risk Impact Criticality at Developmental Stage and testing of hypothesis 1:

Risk Impact Criticality for each parameter considered for development stage have been shown in the Table 20. It could be seen that the calculated values of 'F' are less than the critical values and 'p'-values are greater than 0.05. As the 'p'-value measures the amount of the statistical evidence that support the null hypothesis with lower the evidence to support null hypothesis, the smaller is the 'p'-value'; hence for the instant purpose we must accept the null hypothesis and conclude that there is strong evidence for views expressed by the respondents are not significantly different. Out of the chosen nine (9) risk parameters, 'Availability of land for Project Development', 'State Support Agreement', 'Awareness/interest of the Project financier', 'Clarity of concession proposal' and 'Fairness of bidding Process' have got Risk Impact Criticality rating above critical range (0.5). However, 'Superficial Consideration of host govt.', 'Bilateral Agreement among financier', 'Apprehensions about Technical and financial feasibility' as well as "Method taken up for bidding" are though considered as risk factors, do not pose as critical. Thus, majority of supporting risk parameters for hypothesis 1 have given a risk impact criticality above the threshold value. Further, it could be seen that 'land availability issue', which was one of the most important factor at first stage of survey has come out as the most impacting risk for the PPP infrastructure project development. The second and the third most important impacting factors, coming out as per the survey are 'State Support Agreement' and the 'Interest of Financier on the project'. Many projects in India including the 'Gurgaon Delhi Express way' project had suffered a lot due to land acquisition related delays.

In view of the above discussions, we could infer that our hypothesis postulating that there is Developmental risk for a PPP project even after the decision to go for the project could draw strong statistical supports.

Risk factors	Risk event's particulars	Mean of all categories of respondents	SD	Risk Impact Criticality (RIC)	Rank w.r.t. RIC	ANOVA	
						F	p-value
Superficial considerations of host govt.	Occurrence	2.79	0.082	0.367	7	0.791	0.537
	Importance	3.28	0.304				
Non Clarity of Concession Proposal	Occurrence	2.92	0.126	0.510	4	0.338	0.851
	Importance	4.36	0.111				
Non Awareness/interest of project financier	Occurrence	3.19	0.079	0.541	3	0.402	0.806
	Importance	4.25	0.238				
Nonexistence of Bilateral agreement among the financiers	Occurrence	2.96	0.142	0.364	8	0.619	0.651
	Importance	3.08	0.354				
Nonexistence of State Support Agreement	Occurrence	3.91	0.155	0.684	2	1.31	0.28
	Importance	4.38	0.279				
Apprehensions about technical & financial feasibility	Occurrence	2.92	0.125	0.378	6	1.522	0.211
	Importance	3.23	0.371				
Non availability of Land for Project Development	Occurrence	3.83	0.147	0.696	1	0.052	0.995
	Importance	4.55	0.112				
Non proper Method taken up for bidding	Occurrence	2.53	0.113	0.317	9	0.864	0.492
	Importance	3.13	0.418				
Non Fairness of bidding Process	Occurrence	3.19	0.136	0.500	5	0.866	0.491
	Importance	3.64	0.276				

Table 20: Risk Impact Criticality for Developmental Stage (Risk)

4.3.2. Risk Impact Criticality at Cost-Benefit Analysis/ Stage and testing of hypothesis 2:

Three (3) parameters as per Table 21 have been used to test the hypothesis regarding cost benefit and accordingly the supporting questionnaires were framed. Risk Impact Criticality evaluated from the responses of the second stage survey responses are presented in Table 21 with ranking of risk parameters. It can be seen that Fault in 'Economic viability survey' and 'Fault in Concession proposal' are the critical risk factors (Risk Impact Criticality value more than 0.5) for Cost Benefit analysis; while 'Fault in the method of C-B Analysis' does not pose to be critical in the opinion of the respondents.

Furthermore, it is seen that calculated 'F' is smaller than the critical value of 'F' at 5% level. Hence, for all the three parameters null hypothesis has been accepted, concluding that view expressed by the respondents is not significantly different. In Table 21 'p'-values are greater than 0.05 and hence, at 5% level null hypothesis could draw strong statistical support. Again, out of three chosen risk parameters two are falling under critical range. Therefore, overall, hypothesis 2 could garner statistical evidence towards its support. It can also be seen from the table that Economic viability survey is the most impacting risk in Indian infrastructure projects taken up through PPP mode. A detailed discussion and a case study illustration have already been taken up in Chapter-6 of this thesis for Cost Benefit Analysis. Detailed economic & financial analysis is of paramount importance for any project. 'Delhi Noida Bridge' project had to be financially restructured more than once due to the above reason. In most of the projects, sensitivity analysis of IRR and DSCR with a limited number of variables was the only assessment carried out for evaluating the financial risks involved. None of the

projects had undertaken any formal political and other important risk/feasibility analysis. This finding is well supported by Thomas A.V., (2002). However, in detail regression analysis taken up in the subsequent section would give us the clear picture about the most influential risk factors in a particular category.

Risk factors	Risk event's particulars	Mean of all categories of respondents	SD	Risk Impact Criticality (RIC)	ANOVA		
					Rank w.r.t. RIC	F	p-value
Fault in Economic viability survey	Occurrence	3.51	0.277	0.546	1	0.581	0.678
	Importance	3.91	0.382				
Fault in Method of Cost Benefit Analysis	Occurrence	2.83	0.113	0.389	3	1.757	0.153
	Importance	3.43	0.434				
Fault in Concession Proposal	Occurrence	2.94	0.109	0.506	2	0.164	0.955
	Importance	4.30	0.221				

Table 21: Risk Impact Criticality for Cost-Benefit Analysis/ Stage (Risk)

4.3.3. Risk Impact Criticality at Construction Stage and testing of hypothesis 3:

The risk impact criticality of the chosen risk parameters at construction stage as identified from the second stage survey of this research can be seen at Table 22. It could be seen that the calculated "F" value is less than the critical value and 'p'-value is greater than 0.05 indicating that null hypothesis is acceptable at 5% significant level.

Out of the chosen risk parameters 'Land acquisition process for construction', 'Quality Assurance', 'Technical & Financial soundness of the firm', "Utility shifting at project site", "Detailed Engineering Survey", 'Policy adopted to mitigate cost-time overruns', 'Prevailing law & order situation at site' and 'Men & Machineries available for construction' have got Risk Impact Criticality value above 0.50 indicating that the parameters are critical for construction risk. For rest of the parameters, though risk is involved, the same do pose as critical. In order of precedence, Land acquisition risk is again prevailing here as per survey responses. However, 'Quality Assurance' and 'Technical & Financial soundness of the firm' have got second and third preference respectively. The 'Quality Assurance' in PPP project is an important factor as because the same party has to own the responsibility of O&M in long run, and hence does not want to compromise at the construction stage. Second, the design & technology risk associated with the quality construction, also have to be borne by him only in most of the PPP frameworks. Technical & Financial soundness of the agencies depend lot on managing their risk capability of Technical and the financial risks. However, the ranking of the factors based on responses of different categories of respondents have more thoroughly analyzed with regression analysis models, but out of the scope of this paper.

Risk factors	Risk event's particulars	Mean of all categories of respondents	SD	Risk Impact Criticality (RIC)	Rank w.r.t. RIC	ANOVA	
						F	p-value
Lack of Technical & Financial soundness of the firm	Occurrence	3.72	0.300	0.606	3	0.892	0.476
	Importance	4.09	0.406				
Poor Prevailing law & order situations at site	Occurrence	3.19	0.181	0.501	7	1.104	0.366
	Importance	3.92	0.367				
Poor Accessibility & Communication network of site	Occurrence	2.98	0.170	0.435	11	0.849	0.501
	Importance	3.66	0.433				
Non smooth Land acquisition process for construction	Occurrence	4.08	0.149	0.744	1	0.056	0.994
	Importance	4.57	0.096				
Non shifting Utilities at Project site	Occurrence	3.77	0.185	0.596	4	1.267	0.296
	Importance	3.94	0.280				
Non arrangements for material supplies	Occurrence	3.36	0.261	0.444	9	1.073	0.38
	Importance	3.30	0.207				
Men & Machineries not available for construction	Occurrence	3.17	0.324	0.450	8	0.211	0.931
	Importance	3.58	0.476				

Continue...

Risk factors	Risk event's particulars	Mean of all categories of respondents	SD	Risk Impact Criticality (RIC)	Rank w.r.t. RIC	ANOVA	
						F	p-value
Non availability for Supply of Power & Water	Occurrence	2.51	0.047	0.347	16	0.267	0.898
	Importance	3.45	0.112				
Lack of Detailed Engineering Survey	Occurrence	3.34	0.167	0.528	5	0.514	0.726
	Importance	3.96	0.343				
Wrong preparation of construction schedules	Occurrence	2.79	0.120	0.437	10	1.261	0.298
	Importance	3.91	0.380				
Improper Method adopted for project scheduling	Occurrence	2.89	0.121	0.371	15	1.364	0.26
	Importance	3.21	0.361				
Lack of Quality assurance	Occurrence	3.94	0.159	0.609	2	0.814	0.523
	Importance	3.87	0.360				
Non Adherence to labour rules	Occurrence	3.04	0.247	0.413	13	0.76	0.556
	Importance	3.42	0.437				
Safety regulations	Occurrence	3.08	0.146	0.427	12	0.161	0.957
	Importance	3.47	0.056				
Non Effectiveness of escalation clauses	Occurrence	2.66	0.185	0.381	14	2.237	0.079
	Importance	3.60	0.777				
Improper Policy adopted to mitigate cost-time overruns	Occurrence	3.04	0.143	0.502	6	0.473	0.755
	Importance	4.13	0.270				

Table 22: Risk Impact Criticality for Construction Stage (Risk)

Since, our null hypothesis has been accepted at 5% significant level and half of the numbers of risk parameters have shown critical ratings; therefore, the hypothesis 3 has drawn strong evidence towards its standing.

4.3.4. Risk Criticality at O&M Stage and testing of hypothesis 4:

Seven risk parameters as given Table 23 with supporting questionnaires in the Second stage of Survey have been chosen for evaluation/ testing of the hypothesis. It could be seen easily that the calculated 'F' value is below critical for all but parameter 'O&M clauses'. The 'p'-values are larger than 0.05 except for 'O & M clause' parameter, indicating that null hypothesis against the parameter 'O&M' clauses have been rejected. However, null hypotheses for the other six parameters out of the seven parameters have been accepted. Post-Hoc test (Turkey HSD) test carried out for the parameter O&M clauses and showed that promoter's perception on risk criticality was significantly different from the Consultant and Others. Both the Consultant & Other categories of respondents have identified this risk with much high impact criticality; promoters did not appear to hold the same view regarding the clauses of O&M. As per an informal interaction with few of the promoter representatives at a later stage, it was revealed that they were more concerned about actual O&M actions and follow up at sites, rather than to look into pros and cons of the O&M clauses.

Referring to Table 23, the parameters 'Parallel Project Development', 'Method of levy of toll', 'Minimum levels of facility users', 'Quality Assurance and Service' all have Risk impact criticality value above the threshold of 0.50 and hence considered critical. The impacts of rest of the parameters do not pose as critical. Most critical impacting risk in O&M phase is 'Parallel Project Development'. The second and third one, are 'Method of toll revenue collection' and the 'Minimum level of facility users'. All these are direct risk factors to 'Demand Revenue Risk', which are already, identified 'most critical' risk factor in first stage. Many projects in India had suffered greatly due to this factor; DND Bridge, Coimbatore Bypass is to name a few. It may not be out of interest to see from the same table that 'Quality & Services', plays the next vital role because of the long term association of the same builder in case of PPP.

Risk factors	Risk event's particulars	Mean of all categories of respondents	SD	Risk Impact Criticality (RIC)	Rank w.r.t. RIC	ANOVA	
						F	p-value
Lack of Quality assurance & services	Occurrence	3.51	0.522	0.525	4	1.618	0.185
	Importance	3.77	0.549				
Lack of Performance guarantee /warrantees	Occurrence	2.45	0.183	0.402	7	0.961	0.438
	Importance	4.09	0.447				
Improper O & M clauses	Occurrence	3.02	0.157	0.497	5	2.939	0.030*
	Importance	4.11	0.504				
Improper Method of levy of toll	Occurrence	3.36	0.065	0.611	2	0.072	0.99
	Importance	4.55	0.076				
Parallel Project Development	Occurrence	3.30	0.174	0.617	1	0.301	0.876
	Importance	4.68	0.096				
Nonexistence of Minimum levels of facility users	Occurrence	4.00	0.107	0.600	3	2.192	0.084
	Importance	3.75	0.591				
Alternative proposal for revenue generations	Occurrence	3.15	0.191	0.478	6	1.238	0.308
	Importance	3.79	0.390				

Table 23: Risk Impact Criticality for O&M Stage (Risk)

* Significant at 5% level

In view of the foregoing discussions, we can infer that the hypothesis 4 which was postulated as there would be Performance and Operating risk for a PPP project once the project was commissioned, did stands at 5% level.

4.3.5. Risk Impact Criticality for Legal issues and testing of hypothesis 5:

Out of the five chosen parameters as per Table 24, 'Expeditious handling of legal cases', 'Land acquisition process legalities' and 'Environmental rules' have criticality values more than 0.50. Parameters 'Sufficiency of present law of the Nation to deal with PPP' and 'Arbitration clauses' do not pose as critical. However, all the calculated values of 'F' are less than critical 'F' value and 'p'-value is larger than 0.05. As 'p-value' measures the amount of the statistical evidence that support the null hypothesis and the lower the evidence to support null hypothesis, the smaller is the 'p-value'; for the instant case we can conclude that the opinion of the respondents are not significantly different and our null hypothesis must be accepted at 5% level.

As presented in the Table 24, 'Expeditious handling of the legal cases' appeared as the most critical impacting factor. Since, 'time' is the essence of any project management and more so in case of PPP projects, the tedious process of legal handling is not acceptable to most of the stack holders. Many PPP projects like Coimbatore Bypass had already suffered due to legal process. Secondly, legal handling of 'land acquisition process' also appeared as a most concerning factors for the PPPs. Environmental issues too have vital importance impacting factor rating as seen from the survey responses.

Risk factors	Risk event's particulars	Mean of all categories of respondents	SD	Risk Impact Criticality (RIC)	Rank w.r.t. RIC	ANOVA	
						F	p-value
Land acquisition process legalities	Occurrence	3.283	0.090	0.597	2	0.065	0.992
	Importance	4.547	0.065				
Environmental rules	Occurrence	3.019	0.136	0.506	3	0.704	0.593
	Importance	4.189	0.227				
Arbitration clauses	Occurrence	2.906	0.162	0.381	5	0.199	0.938
	Importance	3.283	0.106				
Non-Sufficiency present law of the Nation to deal with PPP	Occurrence	3.660	0.133	0.422	4	1.028	0.402
	Importance	2.887	0.438				
Non-Expeditious handling of legal cases	Occurrence	4.038	0.106	0.677	1	0.613	0.656
	Importance	4.189	0.167				

Table 24: Risk Impact Criticality for Legal Risk

In view of the foregoing discussions, we can infer that hypothesis 5 of this study draws strong support with statistical evidences.

4.3.6. Risk Impact Criticality for Regulatory issues and testing of hypothesis 6:

Risk impact Criticality concerning the regulatory related parameters are presented in Table 25 based on compiled / analyzed data of second stage of survey. The 'Role of regulatory Bodies' is the most critical impacting risk followed by 'Tariff change option' and 'Role of foreign investors & regulations thereof'. Out of these, 'Role of regulatory bodies' appeared to be critical. As was highlighted by Gupta A. K. (2013), the importance of regulatory bodies in case of PPP project cannot be denied in any manner. A regulator who is fair to consumers and sensitive to the needs of investors is absolutely necessary for infrastructure development through private participations.

Risk factors	Risk event's particulars	Mean of all categories of respondents	SD	Risk Impact Criticality (RIC)	Rank w.r.t. RIC	ANOVA	
						F	p-value
Role of regulatory bodies	Occurrence	3.804	0.119	0.573	1	0.122	0.974
	Importance	3.774	0.255				
Options of tariff adjustments	Occurrence	3.189	0.311	0.460	2	1.393	0.25
	Importance	3.604	0.292				
Role of foreign investors and regulations thereof	Occurrence	2.849	0.317	0.375	3	0.992	0.421
	Importance	3.302	0.365				

Table 25: Risk Impact Criticality for Regulatory risk

It could be seen from Table 25 that the calculated 'F' value is less than the critical 'F' value and 'p'-value is greater than 0.05. Hence null hypothesis is accepted with strong statistical evidence. However, out of three evaluating parameters, two have got Risk Impact Criticality less than the threshold of criticality i.e. 0.50. As such, limited inference could be drawn towards support of the hypothesis 6 postulating as "There is Regulatory Risk for a PPP project once the project commences".

From the ANOVA test of Second Stage of survey responses all the six hypotheses of the study stand as the respondents have concurred without any significance. However, individual supporting questionnaires analysis/deliberations has led to draw limited support towards hypothesis 6. This may be because most of the respondents of Indian PPP projects have not experienced a well-

defined regulatory environment in the particular PPP field or sector specific scenario and hence could not draw conclusive remarks towards the Regulatory risks.

6. Concluding Remarks

Thus overall, it is revealed that in case of PPP projects in India there exist considerable risk for Cost-Benefit Analysis, risk in Development phase, risk in Construction phase as well as in Legal and regulatory fronts. The focal points to be drawn from this study are:

- Infrastructure project developments through PPP mode in India so far have seen mixed outcomes of success and failure. While land acquisition is still considered as a critical issue for taking up PPP projects, commercial justification and debt service repayment have been major concerns among the stack holders. Demand revenue generation & financial risk are the prime factors considered by the stake holders of PPP projects. These finds similarity with Mane *et al.* (2013).
- Financial risk is highest in the construction & operational phase, while debt service risk is predominant in the operational phase. Direct political risk is critically predominant in development phase. Over dependency on commercial banks by the promoters' agencies lead to asset liabilities miss-match for long term projects like PPP and thus needs to be avoided. Institutional Financiers are much more preferred in these types of projects (Haris C., 2008). An active bond market is highly desirable for infrastructure industries growth in the country.
- From the risk allocation preferences, it is seen that Promoter and Government are the prime allocating preferences, with little or negligible allocation to other stake holders of PPP. However, for a win-win model, it is desirable that financial risks are shared by lenders too taking a lead role.
- Inadequate feasibility studies and non-strict enforcements of rules & regulations, malpractices/ corruptions etc. are some of the major concerns highlighted.
- There is a high degree of agreement among the stack holders relating to risk acceptability, contract stipulations vis. a vis. risk management strategy.
- Absence of regulators in each and every field is another issue of concern as was highlighted by Gupta A. K. *et al.* (2013).
- 'Traffic revenue risk' neutral BOT-Annuity modal is the most preferred mode in case of road projects' promoters.
- Framing of the 'Model Concessional Agreement' has by and large ease out many of the critical bottlenecks in case of PPPs. However, expectations are still high for its further improvements.
- There must be well defined dispute resolution mechanisms for projects, with smooth procedural guiding for Arbitration & Reconciliation or for Adjudications. Further, all legal issues must be expeditiously handled for overall win-win situations.

Nevertheless, the public-private partnership has become a viable and popular instrument for public service delivery and it is expected to remain so in years to come.

7. References

- i. Agarwal M. and Purkayastha D., (2011), GMR's Terminal 3 for Delhi Airport: A successful Execution Model for Public-Private Partnership Initiatives?, Case Study No. PROM/010, IBS, Centre for Management Research, Hyderabad, (<http://www.icmrindia.org>).
- ii. Agarwal P. K., (2010), Orientation Programme for Officers of NHAI, Presentation at NITHE, November, 2010.
- iii. Ahluwalia M. S.,(1998), Infrastructure Development in India's Reforms , Planning Commission (<http://planningcommission.nic.in/>)
- iv. Akintoye, A., C. Taylor, and Fitzgerald E., (1998),Risk analysis and management of private finance initiative projects, Engineering, Construction and Architectural Management, No.(1), 9-21.
- v. Akintoye A., Bing Li, Hardcastle C.,Edwards P (2001), Critical Success Factors for PPP/PFI Projects in UK Construction Industries: A factor Analysis Approach, 17th Annual ARCOM Conference, 5-7 September 2001, University of Salford. Association of Researchers in Construction Management, Vol. 1, 895-904.
- vi. Akintoye A., E. Fitzgerald, and Hard castle C., (2002),Public-Private Partnership Projects in the UK-treatment of associated risks by local authorities, Proceedings of CIB W92 Symposium on Procurement Systems, The University of West Indies, St. Augustine, January 14-17, Trinidad & Tobago, 297-316.
- vii. Akintoye A., Beck M. and Hardcastle C.,(2003)., Public-Private Partnerships (Managing risks and opportunities), Edited version, Blackwell Publishing.
- viii. Al-Bahar, J. F., (1989), Risk Management in Construction Projects: A Systemic Analytical Approach for Contractors, PhD Thesis, University of California, Berkeley.
- ix. Anand and Purkayastha D., (2011), Appraising Kolkata Metro Railway Corporation's East West Metro Corridor Project: Case Study No. FINC/068, IBS, Centre for Management Research, Hyderabad, (<http://www.icmrindia.org>).
- x. Arndt, R. H. and G. Maguire,(1999a), Risk Allocation and Identification Project – Survey Report, The University of Melbourne, The Department of Treasury and Finance, Melbourne.
- xi. AECOM Consultant Team, (2007) Case Studies of Transportation Public-Private Partnership around the world, Final Report Work Order 05-002, Office of Policy and Government Affairs, US Department of Transportation, Federal Highway Administration, July 2007 (www.fhwa.dot.gov/ipd/pdfs).

- xii. Alinaitwe H.,(2012), Contractor's Perspective on Critical Factors for Successful Implementation of Private Public Partnerships in Construction Projects in Uganda, Second International Conference on Advances in Engineering and Technology (<http://cedat.mak.ac.ug/publications>).
- xiii. Awad E. M.,(2006), System Analysis and Design,Galgotia Publication Private Limited, New Delhi.
- xiv. Baldwin, J. R., H. R. Manthel, and Horns R.B.,(1971). Causes of Delay in Construction Division, ASCE, November, 1971.
- xv. Banarjee B. and Raghuram G.,(1999), Konkan Railway Corporation Limited, IIM Ahmedabad case studies, IIMA, MAR0321.
- xvi. Baruah P. and Kakati M., (2014), Pricing and Financing of Infrastructure Projects; the Challenge before the Indian Policymakers, Journal of Management and Science, Vol. 4, No. 2, pp 28-54.
- xvii. Beildleman, C. R. et al. (1990), On allocating risk, the essence of project finance, Sloan Management Review, 47-55.
- xviii. Billand C. J., (1993), Private Sector Participation in Land Development (Guidelines for increasing cooperation between local government and private developers),Habitat International, Vol. 17, No. 2, pp. 53-62.
- xix. Chakraborty A., Gap bridged, new hurdle for Kolkata Metro Rail Corporation, The Times of India, January 8, 2014 (<http://timesofindia.indiatimes.com>).
- xx. Chapman, C. B. and D. F. Cooper, (1983), Risk analysis: testing some prejudices, European Journal of Operation Research, 14, 283-247.
- xxi. Chatterjee Vinayak, (2012), PPP in India: The storey so far, Business standard, May-14 2012.
- xxii. Cheung Esther and Chan Ping-Chuen A. and Kajewski, Stephen L., (2009), Reasons for implementing public private partnership projects: perspectives from Hong Kong, Australian and British practitioners, Journal of Property Investment and Finance, 27(1). pp. 81-95.
- xxiii. Chen C, Doloi H, (2007), BOT application in China: Driving and impending factors, Article in press, International Journal of Project Management.
- xxiv. Chouhan Sonia, (2004), Evaluation of BOT Project on Highway Sector, Indian Highway Vol.9 No.11 PP 44-48 ASCE.
- xxv. Cronbach L. J.,1951, Coefficient Alpha and The Internal Structure of test, Psychometrika, Vol 16, No.3
- xxvi. Dash D.K., Delhi HC approves removal of Gurgaon toll plaza, The Times of India, Feb 19, 2014 (<http://timesofindia.indiatimes.com>).
- xxvii. Dash D.K., (2013), IGI Metro to go on, but who pays Rs 2,000 crore debt?, The Times of India, June 29 (<http://timesofindia.indiatimes.com>).
- xxviii. Dhameja Nand & Sastry K.S., Public Sector Restructuring and Privatisation (Including Urban Infrastructure and Public Service Finance), Kanishka Publishers, Distributors, 2002.
- xxix. Diwakar H., Ramasamy, Patir M., Sridhar L. and Kumar V. R. S., (2001),Case Study ofMumbai-Pune Expressway and Coimbatore Bypass, IIM Ahmedabad.
- xxx. Development of Modern Bus Terminal at Amritsar, Case Study, Transport Infrastructure, (<http://www.iddkarnataka.gov.in>)
- xxxi. Dias, A. and P. G. Ioannou, (1995), Debt capacity and optimal capital structure for privately financed infrastructure projects,ASCE Journal of Construction Engineering and Management, 121(4), 404-411.
- xxxii. Erikson, C. A., (1979). Risk Sharing In Construction Contracts, Ph. D. Thesis, University of Illinois, Urbana, Champaign.
- xxxiii. Forsyth T., (2005), Building deliberative public-private partnerships for waste management in Asia, Geoforum, Vol. 36, , pp.429-439.
- xxxiv. Funding the Infrastructure Investment Gap, An analysis by Deloitte Touche Tohmatsu India Private Limited, March 2013, (www.deloitte.com/in)
- xxxv. Govt's pre-fixation with PPP not good for infrastructure: Parliamentary Panel, Indian Express, May 05, 2013 (www.indianexpress.com).
- xxxvi. Gupta A.K., Trivedi M.K. and Kansal R., (2013), Risk Variation Assessment of Indian Road PPP Projects, International Journal of Science, Environment, and Technology, Vol. 2, No 5, 1017 –1026 (<http://www.ijset.net/vol-5-b>)
- xxxvii. Gupta D. P., (2010), Orientation Programme for Officers of NHAI, Presentation at NITHE, 2010.
- xxxviii. Gupta K., (2013), Public Private Partnership: A Growth Accelerator or A Power Failure?, Property Observer, January.
- xxxix. Goyal S.K., (1996), Political Economy of India's Economic Reforms, Institute for Studies in Industrial Development, New Delhi-02
- xl. Guidelines for Investment in Road Sector (<http://www.nhai.org>).
- xli. Haldea G., (2009a), Public Private Partnership in National Highways, Model Concession Agreement, Planning Commission of India.
- xlii. Haldea G., (2009b), Guide lines for Public Private Partnership, Prequalification of bidders, Planning Commission of India.
- xliii. Haldea G., (2009c), Guide lines for Public Private Partnership, Request for Proposal, Planning Commission of India.
- xliv. Harris C., (2008), India leads developing nations in private sector investment- But the region needs more investment to meet demand, GRID LINES, PPIAF, C/O The World Bank, Washington D.C. 20433, USA, www.ppiaf.org , Note 30, Mar. (<http://www.ppiaf.org>)
- xlv. Harris C. and Tadimalla S. K., (2008), Financing the boom in public-private partnership in Indian infrastructure- Trends and policy implications,GRID LINES, PPIAF, C/O The World Bank, Washington D.C. 20433, USA (<http://www.ppiaf.org>).
- xlvi. Harris C., (2003), Private Participation in Infrastructure in Developing Countries – Trends, Impacts, and Policy Lessons, World Bank Working Paper No.5, The World Bank, Washington, DC.

- xlvi. Hardcastle C., Edwards P. J., Akintoye A. And Li B., Critical Success Factors For PPP/ PFI Projects in the UK Construction Industry: A Factor Analysis Approach, (http://www.civil.hku.hk/cicid/3_events/32/papers/13.pdf)
- xlvi. Ho, Y.F. and Chen, H.L., (2007), Healthy Housing Rating System, *Journal of Architecture*, No. 60, pp.115-136.
- xlix. Ho Y.F. and Wang H.,(2008), Applying Fuzzy Delphi Method to Select the Variables of a Sustainable Urban System Dynamics Model, (www.systemdynamics.org/conferences/).
- i. Indira A., (2005), Cochin International Airport Limited –A case of Public- Private Partnership: Case Study No. ECOA/129, IBS, Centre for Management Research, Hyderabad, (<http://www.icmrindia.org>).
 - ii. Infrastructure Statistics, Ministry of Statistics and Program Implementations, GOI, (http://mospi.nic.in/Mospi_New/is_8.html)
 - iii. Kateja A., (2012), Building infrastructure: Private participation in emerging economies, International Conference on Emerging Economies – Prospects and Challenges, (ICEE).
 - iiii. Kuhad P., (2010), Bidding Process for the Delhi and Mumbai Airports, Secretariat for Infrastructure, Planning Commission.
 - lv. Lakshmanan L., (2008) Public Private Partnership in Indian Infrastructure Development: Issues and Options, Reserve Bank of India Occasional Papers Vol. 29, No.1
 - lv. Lall R.B. and Anand R., (2008), Financing Infrastructure, Business Standard India 2009, Business Standard Books, New Delhi.
 - lvi. Lam, W. H. K. and Tam M. L., (1998), Risk analysis of traffic and revenue forecasts for road investment projects, *Journal of Infrastructure Systems*, 4(1), 19-27.
 - lvii. Levin, I. R. and Rubin, D. S., (1998). *Data Analysis for Management*, Prentice Hall of India Pvt. Ltd., New Delhi.
 - lviii. Mahapatra A.P.,(2011), Building India with Project Management, Manage India, PMI India Communications, PMI Organization Centre Private Limited, Mumbai-51, Vol 3, Issue 4 (www.pmi.org.in).
 - lix. Malini, E., (1997), Evaluation of financial viability of BOT transport infrastructure projects, *Journal of Indian Road Congress*, 58(1), 87-123.
 - lx. Malini E. (2011), Financial Structuring of Public-Private Partnerships for Road Infrastructure Projects in India, *International Journal of Applied Public-Private Partnerships*, Volume 1, Issue 3.
 - lxi. Mane S. and Pimplikar S.S., (2013), Risk Assessment of BOT Projects, *International Journal of Computational Engineering Research*, Vol, 03, Issue, 8 (<https://archive.org>).
 - lxii. Maniar H., Financial Viability of Project- A case study on Mumbai- Pune Express Highway (<http://www.financialexpress.com/fe/daily>) .
 - lxiii. Maniar H., (2010), Risk Analysis of Infrastructure Projects – A Case Study on Build ~Operate~Transfer Projects in India, *The IUP Journal of Financial Risk Management*, Vol. II, No.4
 - lxiv. Mazumdar P.,(2010), An Analytical Study on Consumer Evaluations of Brand Extensions, Ph.D Thesis, Submitted to Gauhati University.
 - lxv. Moody's Global Project Finance, Construction Risk in Privately Financed Public Infrastructure (PFI/PPP/P3) Projects, December 2007.
 - lxvi. NHA pushes for revival of highway sector, knocks at PM's office, *The Times of India*, MAY 27th, 2013
 - lxvii. Nassiuma DK, *Survey Sampling: Theory and Methods*. University of Nairobi Press, Nairobi. 2000
 - lxviii. Ogunlana S. O., Promkuntong K., (1996), Construction delays in a fast growing economy: comparing Thailand with other economies", *International Journal of Project Management*, Vol. 14, No. 1, pp.37-45.
 - lxix. Perry, J. G. and Hayes R. W., (1985), Risk and its Management in Construction Projects, *Proceedings of the Institute of Civil Engineering*, 78(1), 499-521.
 - lxx. Pramanik A.,(2014), Fresh troubles for Kolkata's East-West Metro project, *Business Line*, January 3rd (www.thehindubusinessline.com).
 - lxxi. Prasad V.S.,(2013), Road Infrastructure Planning – Way Forward, *Indian Highways*, Feb- 2013. Hyderabad (<http://www.icmrindia.org>).
 - lxxii. Prasad V. N. and Govind S., (2006), The Delhi Metro Project: Effective Project Management in the Indian Public Sector, : Case Study No. PROM/005, IBS, Centre for Management Research,
 - lxxiii. Pargal S.,(2007), Concession for Delhi Noida Bridge, Secretariat for the Committee on Infrastructure, Planning Commission, New Delhi.
 - lxxiv. PPP not feasible for Metro Projects: E Sreedharan, *The Times of India*, July 21, 2013, (<http://timesofindia.indiatimes.com>).
 - lxxv. PPP Toolkit for Improving Decision making Processes, Ministry of finance, Government of India (www.toolkit.pppindia.com)
 - lxxvi. Priya M.S. and Jesintha P., (2011), Public Private Partnership in India, *Journal of Management and Science*, Vol.1, No.1
 - lxxvii. Ramesh, C. R.,(1999), Experience in execution of Hubli – Dharward Bypass by BOT concept, *Civil Engineering and Construction Review*, New Delhi, 11, pp. 23-29.
 - lxxviii. Ramdev R., Credit Squeeze, *Indian Infrastructure*, 14, # 5, Dec. (2011),pp.14-15.
 - lxxix. Rapid Environmental Impact Assessment Report for integrated Municipal Solid Waste Management Project at Boragaon site Guwahati, Assam, Guwahati Waste Management Company Private Limited (GWMCP), February 2008 (http://www.pcbassam.org/ExeSummary_GMC_ISWMP)

- lxxx. Rai Vinod,(2009), Foreword, Public Private Partnerships (PPP) in Infrastructure Projects, Public Auditing Guide, Comptroller & Auditor General of India (<http://www.infrastructure.gov.in>).
- lxxxii. Ramana N. V. and Dutta S., (2002), Coimbatore Bypass Road Project: Case Study No. FINC/010, IBS, Centre for Management Research, Hyderabad (<http://www.icmrindia.org>)
- lxxxiii. Reference Guide, Public Private Partnerships, Version 1.0, World Bank Institute, (PPIAF), 2012, (<http://www.ppiaf.org>).
- lxxxiv. Report on India Infrastructure Debt Fund (IIDF), 2010, (<http://www.infrastructure.gov.in/pdf/India-Infrastructure-Debt-Fund.pdf>).
- lxxxv. Salzman, A. and Mohamed S., (1999), Risk identification frameworks for international BOOT project, Profitable Partnering in Construction Procurement, Edited by Ogunlana, S.O., E&F.N Spon Ltd., London, 475-486.
- lxxxvi. Shridharan G., (1997), Factors affecting international joint ventures – a research model, Proceedings of the first international conference on construction industry development- Building the future together, Singapore, 84-81.
- lxxxvii. Singh L.B. and Kalidindi S.N., (2009); Financing Road Projects in India Using PPP Scheme, Proceedings of the 2009 Mid-Continent Transportation Research Symposium, Ames, Iowa State University, Iowa.
- lxxxviii. Singh L. B. and Kalidindi S. N., (2006); Traffic revenue risk management through Annuity Model of PPP road Projects in India, International Journal of Project Management, Vol. 24, pp.605-613.
- lxxxix. Sinha, R. C., (1999), BOT – as a model for infrastructure investment was a special reference to roads and bridges, Journal of Construction Management NICMAR, 14(4), 294-307
- xc. Smith G.R. and. Bohn C.M., (1999), Small to medium contractor contingency and assumptions of risk, ASCE Journal of Construction Engineering and Management, 125(2), 101-108.
- xcii. Srinivasan L., (2000), Land acquisition process made easy, Indian Highways, 28(3),24-30.
- xciii. Standardization of PPP Contract provisions in India, Consultation Document for Consultation with Private Sector Bodies, Department of Economic Affairs, Ministry of Finance, Government of India, 2009
- xciv. Singh S.P., (2013), What is wrong with PPP in India?, Business Standard,(www.business-standard.com)
- xcv. Sidhartha , (2013), Infrastructure projects worth Rs 7 lakh crore stuck in red tape, The Times of India, Mar 21, 2013 (www.timesofindia.indiatimes.com)
- xci. Tah, J.H.M. and Carr V.,(2000), A proposal for construction project risk assessment using fuzzy logic, Construction Management and Economics, 18(4),491-500.
- xcvi. Tiong R.L.K., (1990), BOT projects: risk and securities, Construction Management in Economics, 8, 315-328.
- xcvii. Thomas, A. V.,(2002), Identification, Assessment and Allocation of Critical Risk in Indian BOT Road Projects, Ph. D. Thesis, IIT Madras, Chennai-36.
- xcviii. Thomas A. V., Satyanarayana N. K., Ananthanarayanan K., (2003),Risk Perception Analysis of BOT Road Project Participants in India,Journal of Construction Management and Economics, Vol. 21,No. 4, June-2003, pp 393-407.
- xcix. Thomas A.V., Satyanarayana N. K., Ananthanarayanan K., (2005), Adequacy of Developmental efforts in Indian BOT Road Projects, INDIAN HIGHWAYS, Vol.33, No.7, July 2005, pp 41-55.
- c. Thomas A.V., Satyanarayana N. K., Ganesh L.S.,(2006), Modelling and assessment of critical risk in BOT road projects”, Construction Management and Economics, Vol.24, No.6, pp 407-424.
- ci. Thomas C., (2010), Orientation Programme for Officers of NHAI, Presentation at NITHE, November, 2010.
- cii. Vikram K.,(2013), Delhi Metro crawls in Phase III, land acquisition hinders work, India Today, June 26th.
- ciii. Wang, J.X. and M.L. Roush, (2000), What Every Engineer Should Know About Risk Engineering and Management, Marcel Dekker, Inc. New York.
- civ. Wang, S.Q., Tiong R.L.K., Ting S.K., and Ashley D.,(2000), Evaluation and management of political risks in China’s BOT projects, ASCE Journal of Construction Engineering and Management, 126(3), 242-250.
- cv. Yang W., Tian C.,(2012), Monte-Carlo simulation of information system project performance, Systems Engineering Procedia 3, 340 – 345.
- cvi. Zhu L. and Chua D.K.H.,(2009), Game Theory-based Model for Insurance Pricing in Public-Private-Partnership Project, Department of Civil & Environmental Engineering, National University of Singapore, 10 Kent Ridge Crescent, 119260, Singapore.