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Risk Identification and Analysis in Hybrid Annuity Road Project

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ABSTRACT:As there are risk and problems faced while completion of HAM projects in India. There are various factors for leading to this risk at the time of execution (Construction, Operation & maintenance and Transfer) phase of any HAM project. With the use of HAM model in the road network development. It has been seen that there is some occurrence of problems and risks in the project. It has now become important to Identify and Analyse these risks at the execution (Construction, Operation & maintenance and Transfer) stage of the project lifecycle. This will help to reduce the risk undertaken by both the public and private sectors and also will result in the timely delivery of the project to the public. A deep study on this topic will result in easy management of the construction, Operation & Maintenance and Transfer phases and also helps in avoiding the delays.

KEYWORDS: (HAM project, construction Operation and Maintenance, Transfer, Risk, Concession Agreement)

I. INTRODUCTION

Indian Road Scenario

Infrastructure is an intrinsic module for the overall development and growth of an economy. It furnishes all the primary services that are required by the people in their day-to-day life which includes the social wellbeing, health and safety of citizens. It also extends essential support to public by satisfying their basic requirements and generates high productivity.

India ranks fourth among the biggest economies in the world, but one important factor that contributes to inhibit its development and advancement is the lack of world class framework of infrastructure. The GDP growth of India is reported to decline by 1-2% every year due to absence of adequate infrastructure. Quick growth of the economy in recent times has placed an increasing stress on existing physical infrastructure such as roads, railroads, ports, airports, electricity, irrigation, water supply and sanitation, all of which now experience the ill effects of a substantial deficit.

To help develop the Indian infrastructure to a world class position and to diminish infrastructure deficiency there are a lot of issues that needs to be addressed in various infrastructural fields. In the initial years of development of infrastructure the government used to take all the measures or if a project was not taken by the government, it was completely handled by the private sector. This method of handling the infrastructural sector by only one sectors i.e. either public or private sector was not very efficient and created problems of fund sourcing. The investment requirements are very large and cannot be met by the public sector alone due to fiscal limitations and ascending liabilities of the Government and also because the resources needed are limited and are have much more requirement than what the public sector can provide.

This situation demands the private sectors to participate in collaboration with the public sectors to develop the public infrastructural facilities. To reach this objective the Government of India thought of implementing a whole different model or framework for the development of infrastructural facilities and called this framework Public Private Partnership (PPP). The major reasons that contributed to the growing involvement of private sector towards development of infrastructure included efficient project delivery and operations, matching the increasing needs of investment through additional resources and having rapid access to advanced technology.

The following table defines the difference of working of the public sector, private sector and the combined working of public and private sector i.e. PPP framework. The inferences that can be made from the following table is that there has been seen progress in the development of the infrastructure sector because of the increases use of PPP. PPP led to sharing of risk between the public and the private sector which did not put all the burden at one party and it also increased the



investments s both parties contributed to the project. In financial year 2016, India has the second largest road network in the world, spanning over total 5.23million kilometre. Over 64.5 percent of all goods in country are transported through roads, while, 85.9 percent total passenger traffic uses road network to commute. During financial year 16-17, the Government of India allocated a Budget of Rs 97000 crore for the development of roadways across country.

The road network is of indifferent quality, partly because of the rural connectivity syndrome, sans an emphasis on arterial highways. Out of 5.23 million kilometres of total road network, National Highway accounts 1,00,475 kilometres and share 2.0% of the total roads in India, State highways share 1,48,256 kilometres share: 3.0 per cent of the total roads in India and District and Rural roads49,83,579kilometersShare: 95.0 per cent of the total roads in India.

Though national highways share 2% of total road network they carry 40% of the total traffic only 15% of the National highway network is four laned. Commercial vehicles can run only 200-250 Kms. per day as compared to 600 Kms. in developed countries.

Public Private Partnership (PPP)

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Public Private Partnership (PPP) plays a very important role in the infrastructural development of the nation. It consists of various models which could be adopted for the contractual agreement between the concessionaire and private party. These models play a key role because it determines the type role which would be shared between the private and public party. So, before going for the actual construction work a proper model should be adopted which would facilitate a smooth flow between both the parties. So, it depends on the government that what type of model they incorporate and that depends on the



kind of work which they undertake. For example, if we take the construction of road network then there are many models which could be used but for the sake of interest of the private company a suitable model should be used which would help to share the different kinds of risk and help to complete the work on time.

So, PPP has made a significant contribution towards the development of the country. The kind of idea that is put behind the concept of PPP is really beneficial. As we know that the capital investment is really a big issue if we consider any infrastructural development plan, so the idea of funding by the investors seeking an opportunity of profit really attracted them to invest in these growing and profitable construction development work.

The overall concept of PPP has really benefited India in the infrastructural growth in the last few decades. This has also lessened the burden of finance over the Indian Economy and has enabled the government to use the money in more people concerned projects. In this paper study has been made over the two PPP models which are HAM and BOT projects which are both highway projects. Both of these models have got significance in the way projects are being executed. Both of them have got some advantages and disadvantages over the other whether it is about risk allocation, financial burden, land clearance etc. So, it depends upon the government for the kind of model concession agreement that is being signed between the concessionaire and the public party. Apart from these models there are several other models which are equally important and useful. In all those models difference lies in the way projects are handled, designed, built, financed, risk allocated, land clearance, revenue collection rights etc. So, in this paper focus would be given to only HAM & BOT modes of PPP.

The Various PPP Models Adopted By NHAI:

Following are the various PPP models adopted in India :

BOT (Toll) Model:- In the BOT (Toll) model, the Concessionaire recovers his investment by charging toll i.e. fee levied to the road users for using the road facility developed. This model reduces the fiscal burden on the government while also allocating the traffic risk, financial and commercial risk to the Concessionaire. This is the model used for most of the projects under PPP in India and can be regarded as the default model for highway projects.

BOO (Build Own Operate) :- Under Build Own Operate, investor or private party finance, construct, own, operate and maintain the infrastructure and does not have any responsibility to transfer it back to government but the government holds the ownership of assets made so it can be a financial risk to private party. In this case also the investor will gain its spent money and profit on project by collecting tolls, rentals or fees from users.

BOLT (Build-Own-Lease-Transfer) :- Under this approach, concessionaire builds the project, owns it and then leases the facility to another private party for a specific period of time. As the lease time ends the project goes und government.

BOOST (Build-Own-Operate-Share-Transfer) :- In this model, concessionaire deals with the financing, constructing, operating and maintaining the project, the difference with own word is this, that the private party can use any means of methods in construction and operation of project. Here also the proponent can recover its money and profit by collecting tolls, fees etc. from the users.

(LDO) Lease Develop Operate: - This is a PPP model in the infrastructure sector. Here, the government or the public sector entity retains ownership of the newly created infrastructure facility and receives payments in terms of a lease agreement with the private promoter.

Hybrid Annuity Model: - The hybrid annuity model was conceived in the previous financial year 2015-16 to bring back private participation in highway projects, which had dried up in the last few years. The model is a mix of EPC and BOT formats, with the government and the private enterprise sharing the total project cost in the ratio of 40:60, respectively. Under this new model, government provides 40% of the project cost during the construction period and the release of funds is linked to the progress of construction

Need Of Study

As there are risk and problems faced while completion of HAM projects in India. There are various factors for leading to these risks at the time of execution (Construction, Operation & maintenance and Transfer) phase of any HAM project.

With the use of HAM model in the road network development. It has been seen that there is some occurrence of problems and risks in the project. It has now become important to Identify and Analyze these risks at the execution (Construction, Operation & maintenance and Transfer) stage of the project lifecycle. This will help to reduce the risk undertaken by both the public and private sectors and also will result in the timely delivery of the project to the public. A deep study on this topic will result in easy management of the construction, Operation & Maintenance and Transfer phases and also helps in avoiding the delays.



II. LITERATURE REVIEW

SR NO	AUTHOR	TITLE	PUBLICATION	PUBLICATION YEAR,VOLUME , PAGE NO.	REMARK
1	Mr.Mithun K. Sawant etal	Analysis of Hybrid Annuity Model (HAM) For PPP in Highway Project	International Journal For Scientific Research & Development	Vol.06 (2), pp. 3-6,2018	Issues related to exemption of vehicles, delayed payments of annuity and litigation are some of the unforeseen ones being faced by the lenders.
2	Mohammad Akrama Ali	Constraints, Issues And Challenges In Public-private Partnership (PPP) Model In Road Construction Industry	IJEDR Journal	Vol. 3 (4), pp. 221-229, 2015	The major issues directly related to limited participation of private sector under PPP scheme have been summarized
3	Mayur S. Ghayal	Effect of Hybrid Annuity Model on Road Project	IJEAT JOURNAL	Vol. 8 (6), pp. 1525-1530, 2019	The limitations in HAM model are change of scope, this clause may lead the project to cost and time overrun.
4	Hsu H Hsiao.	Risk Management In Bot Project	MASSACHUSETTS INSTITUTE OF TECHNOLOGY	Vol. 1 ,pp. 9-22, 2000	Through these analyses and comparisons, it demonstrates a clear point that the government plays a critical role in the risk allocation mechanism of BOT project
5	Aakash Gupta	Major Risks In Bot Road Projects In India	JUIT Himachal Pradesh	Vol. 1 ,pp. 20-24, 2017	This research deals with the issues and risks that identified in the project occur in different phases of the project life cycle



6	Jason Lemp D.	Understanding and Accommodating Risk and Uncertainty in Toll Road Projects	Transportation Research Record Journal	Vol 3. pp. 3-7 2009	In this research paper the risk in PPP models and factors affecting on this risk are discussed
7	Sharmila Mane	Risk Assessment of Bot Projects	International Journal of Computational Engineering	Vol, 03, (8), pp. 63-68 ,2013	In this research, the critical risks associated with India's BOT projects were investigated.
8	Anmol Taneja	Analysis of Hybrid Annuity Model in Construction	CASS-ISSN:2581-6403	Vol. 3, (1) pp- 10-22, 2019	This model essentially the future of construction in order to boost the pace of implementation of construction projects.
9	Professional Risk Opinion	Rating Methodology – Hybrid Annuity Road Projects	ARE Ratings	pp. 7-18, 2018	CARE Ratings analyses each of the above factors and their linkages to arrive at the overall assessment of credit quality of an issuer.
10	Ajit V Patwardhan	Hybrid Annuity Model (HAM) for PPP Projects	NPPO DIGEST	Vol. 1 ,pp. 1-5, 2016	HAM model and its comparison with provisions in earlier BOT and Annuity models, a detailed risk allocation
11	Swapnil Garg	Hybrid annuity model: Hamming risk allocations in Indian highway public-private partnerships	Journal Of Public Affair	Vol. 12, pp. 23-34, 2019	Project awards in the highway sector have picked up with the reconfigured risk allocations that HAM has brought about
12	Vishvandra Singh	Study of HAM in Highway Construction Projects-Owner and Contractor	SSRN Journal	pp. 2-3	Advantages and risk associated with HAM both for client & contractor prospective, which



		Prospective.			will help the stake holders to analyze the latest trends of HAM projects awarded by NHAI.
13	Ankit Kumar	Study of different Public-Private Partnership (PPP) Model for the Road Infrastructure	IRJET Journal	Vol. 4, (3) pp. 2409-2411, 2017	Need Of PPP models in infrastructure. There advantages and risk associate with this model.
14	Manav Gill	Rating Methodology for BOT (Hybrid Annuity Model) Roads	ICRA Journal	Vol. 2, pp. 3-10 2019	For (HAM) road projects, execution risks assume importance during the implementation phase; while post COD, the revenue and operating risks assume greater significance.
15		Model Concession Agreement for Hybrid Annuity Project.	-	-	These models concessionary agreement consist obligation of authority and concessionary.
16	ManiyarJaved Basha	Risk Analysis and Mitigation in BOT Project	IRJET Journal	Vol. 5, pp. 16606,16607, 2016	A detailed overview of the topic with the history and background of risk management in BOT projects.
17	Anmol Okate	Risk management in road construction projects: High-volume roads	IRJET Journal	-	This study contains assessment and allocation of risk for High-volume roads in road construction projects.
18	Sharmila Mane	Risk Assessment of BOT Projects	IJCER Journal	Vol, 03, pp. 1-4, 2017	Risk management, BOT, Infrastructure projects, Mitigating measures, equity risks.



19	Manoj Trivedi	Risk variation assessment of Indian road PPP projects	ResearchGate	Vol. 2, (5), pp. 1017 –1026, 2013	Risk, PPP, AHP, BOT.
20	Rohit Mahajan	Rohit Mahajan	-	-	Setting context for RPA Risk Management.
21	M. H. Lakshmi Devi	Critical Analysis of Risk Management and Mitigation of BOT Projects.	IJRESM Journal	Vol. 2, (7), pp. 219-224, 2019	To carry out a BOT project, both sectors take an advantage of risk sharing from each other.
22	Svetlana V Maslova	Risk management in public Private Partnership Projects in Health care	Academy of Strategic Management Journal	Vol. 16, (4), pp. 2-6, 2017	The article investigates the risk management in public private partnership (PPP) projects.
23	Yan Wang	Article Exploring the Risk Factors of Infrastructure PPP Projects for Sustainable Delivery	MDPI	Vol. 12, pp. 15-26, 2019	In this paper, twenty risk factors associated with infrastructure PPP projects were identified by literature review and in-depth case studies.
24	Alireza Valipour	Risk Assessment in PPP Projects by Applying Different MCDM Methods and Comparative Results Analysis.	MDPI	Vol. 8, pp. 9-17, 2018	To address risk assessment issues, various decision-making techniques have been proposed.



25	Nunzia Carbonara	Risk Management in PPP projects: an empirical study on the motorway sector.	-	-	The paper provides a guideline for both public and private parties in defining a list of significant risks in PPP motorway projects.
26	Mervyn K. Lewis	Risk Management in PPP projects	-	Vol. 12, pp. 5-9, 2001	A PPP is at base risk sharing relationships, in this case to bring out certain desired public outcomes.
27	Hsu-Hsun Hsiao	Risk management in BOT Project	-	May 2000	Based on the two case studies, the answer to the creation of a successful BOT project is that an active participation of government in risk sharing is necessary.
28	Nihit Chandra Srivastava	Risk Management in PPP Project at Construction Companies in India	IJRST Journal	Vol. 3, (02), pp. 175- 176, 2016	To investigate critical risks associated with Build Operate Transfer projects in India is main purpose of this paper.
29	VaijayantiPad iyar	Risk Management in PPP.	-	-	In this research, the critical risks associated with India's BOT projects were investigated.
30	Pawan Deshpande	Risk mitigation Strategies for Public Private Partnership Highway Projects in India.	IJCIET Journal	Vol. 8, (6), pp. 584-594, 2017	The risk mitigation strategies are sector specific and suggested for Indian highway projects scenario in this study.



III. RESEARCH METHODOLOGY

The risks with the HAM projects have increased with its advancement in the market and lead to cost and time overruns. The problem that is defined in the study is the impact of the risks on the construction project and the rank of significance of the risks. Data collected from public and private sector through the study of the material available shows that there is need of deep study of this subject.

Problem Statement

Various models of public–private partnerships have been used for the road sector in India. A combination of concession structure, risk, and market forces has decided the use of compatible model over time. Hybrid Annuity Model is the latest one that is supposed to handle obligations of both the Authority and Concessionaire well in dealing with the proper allocation of risks to achieve the desired goal for efficient infrastructure. Even though HAM has to deal with some risks and has become an area concern. Here in this research the aim focuses on identification of risks with factors leading the same and assessment to mitigate them by contemplating the clauses of concession agreement.

Identification of Problem Statement

After studying several articles on hybrid annuity model, the following are the key features:

1. In the previous build, operate and transfer model, the concessionaire had to manage the financing risk, revenue risk, operation and maintenance risk in addition to the construction risk and the government was only responsible for managing right of ways and granting toll collection rights to the concessionaire. Under HAM, the revenue risk is being borne by the government, part of financial and operating risk is being borne by the government.
2. As the infrastructure development has slowed down, hybrid annuity model has been implemented. Within 3 – 4 years, government financing through short term budgets and long-term annuity will get stressed. This is evident from the fact of selling of stressed project assets. However, it will take time of 3 – 4 years.
3. Also, all the nationalized banks lending to infrastructure is restricted due to imposition of sectoral caps and due to rising non-performing assets. Hence, these banks will not be able to lend for infrastructure for coming two to three years.
4. Under the new hybrid annuity model, the responsibility of the contractor is only to arrange 60% of the project cost. However also for this 60%, promoter will only bring 25 – 30% of own equity and rest would be financed by debt.
5. Infrastructure group's balance sheet is stressed and over leveraged. Banks are not willing to lend because of their rising non performing asset due to poor financial position of the infra groups. Also, these groups don't have the ability to bring further equity.
6. The above issue of equity can be solved if banks and financial institution agree to finance whole 60% of the project costs as the bank guarantees the annuity payment.
7. Another issue with HAM is over pricing. The contractor takes into consideration the promoter's equity, loan, project duration and profit on promoter's equity and operation and maintenance cost. It is observable that projects under HAM are priced 25 to 30% more than under EPC. Ultimately, it will result into high annuity pay-outs and government will be forced to charge higher toll.

Objectives

- Identification of different risks and factors leading the risks in case of HAM road project from literature.
- Identification of different risks and factors leading the risks in case of selected HAM road project.
- Assessment of different risks in case of selected HAM road project.
- To suggest the mitigation measures for the risks identified in selected HAM project

Research Methodology

The research methodology includes both qualitative and quantitative aspects of the study done. The research includes identifying the risks involved in the construction cycle of the BOT projects for road sector which include building of national highways, expressways, link roads etc. it further talks about the effect of these factors on the project delivery time and costs.

The research methodology was carried out in three phases. The first phase defines the problem and identifies the risks. The second phase is based on the methods of collecting data and lastly the third phase deals with the research process.

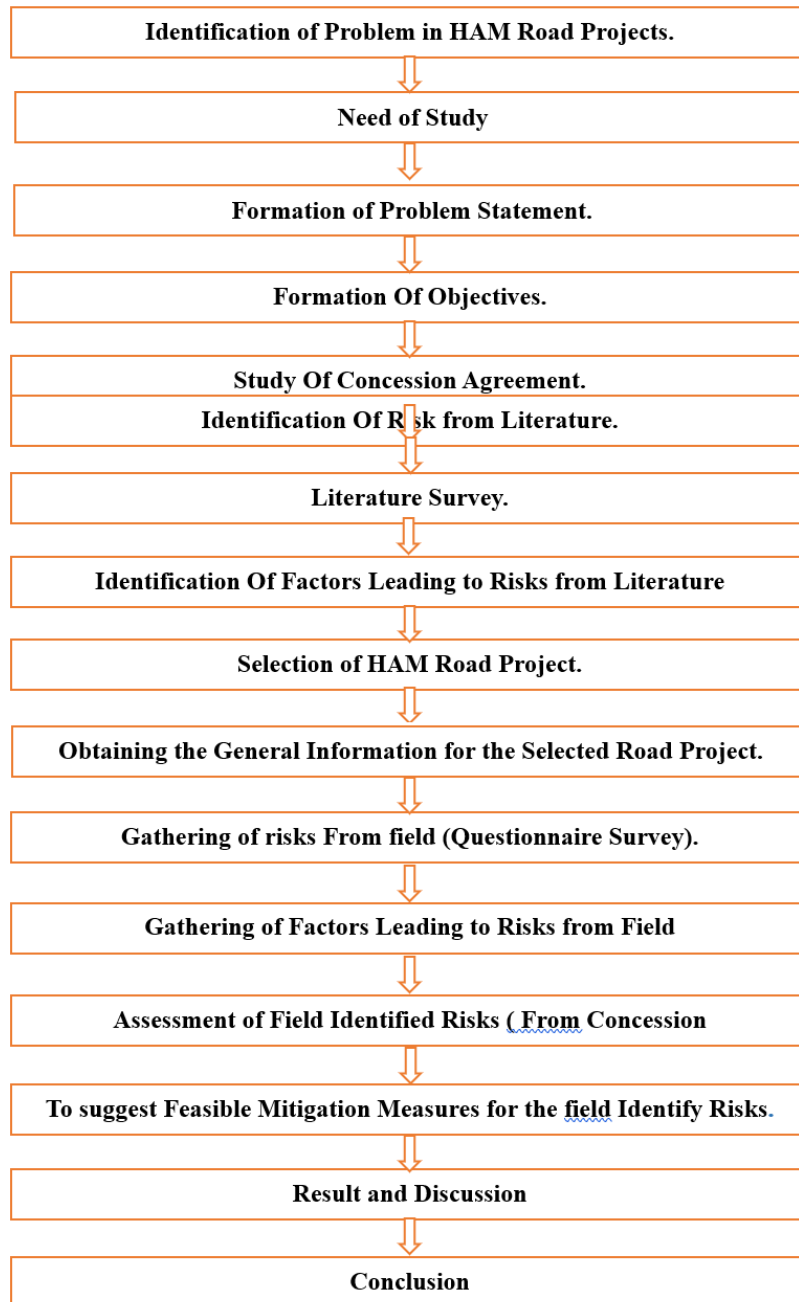


Figure 1: Research Methodology

IV. RESULTS AND DISCUSSIONS

To know the impact of the risks on the project deduced from the study of the literature review questionnaires were formulated and distributed. The questionnaire comprises a list of the risks or constraints and measured them on a five-point Likert scale from 1 being very low, 2 being low, 3 being moderate, 4 being high and 5 being very high. This scale is used to in this questionnaire because of its ease of understandability and because of totality it offers in its simple means and it gives a clear view of the agreement or disagreement of the respondent. The questionnaire is designed to study the views of respondents on the extent to which these risks affect their projects.

Salient Features Of HAM :-

The Value of Money (VfM) considerations over the project life cycle which is central to PPPs has been missing from the highway PPPs bid process until now. HAM closes this gap by introducing this as the bidding parameter. Using pre-



defined discounting rates and cash flow parameters, the construction cost and the first-year maintenance costs are used to calculate the NPV (project cost) and NPV (1st year O&M cost) respectively and sum of these two gives the bid parameter.

The other features of the HAM model are:

The government pays the concessionaire 40% of bid project cost during construction period. This is disbursed in equal instalments linked to project milestone achievements.

The balance 60% of project cost is initially brought in by concessionaire who designs, builds and operates the highway for a period of 15 years after construction.

The government reimburses the concessionaire for its investment in the project (60% of project cost) in bi-annual annuity payments over 15 years as per a predetermined distribution (discussed later). These annuity payments are inflation indexed, with both CPI and WPI components in the ratio 70:30. The discount rate used for the calculation of the NPV has been pre-specified as bank rate +3%. Here the bank rate refers to the rate of interest specified by the Reserve Bank of India from time to time. The responsibility for operations and maintenance (O&M) of the project lies with the concessionaire. For this, the concessionaire is entitled to bi-annual O&M payments along with annuity payments. These payments are also inflation indexed and computed based on the first year's O&M cost provided by the bidder during the initial bid. The government collects the toll revenues, insulating the concessionaire from demand and toll revenue collection risks, and uses these toll revenues to make the annuity and O&M payments.

Table 2: Primary risk allocations in EPC, BOT and HAM models. (Hamming risk allocations in Indian highway public-private partnerships, Journal of Public Affair)

Financing Risk	Government	Concessionaire	Government
Demand Risk	Government	Concessionaire	Government
O & M Risk	Government	Concessionaire	Concessionaire
Construction Risk	Government	Concessionaire	Concessionaire
	EPC	BOT	HAM

Various Risks generated in HAM Road:-

Following are the various risk that are being identified in in various phases in HAM road project along with the factors which are causing those risks

Sr.no.	Risks		Factors in origin
01	Political risk	1 2 3	Changes in legislation/policy. Termination of agreement by government. Attitude of government towards investor/foreign investor
02	Regulation, Social & Legal risk	1 2 3 4	Changes in Law Changes Regulation Environmental clearance/Pollution Land acquisition/compensation/Social impact assessment



03	Support from local government	1 2 3	Support from local/state government. Political opposition Support from local public
04	Construction risk	1 2 3 4 5 6 7 8	Poor geotechnical conditions Poor contract management/non-performance of vendors/subcontractors Availability of Labour/Material Bad weather Cost overrun Time overruns Technology Risk (Unproven technical /design deficiency)
05	Operation and Maintenance (O&M) risk	1 2 3 4 5 6 7	Design deficiency/bad workmanship/ low quality during construction Revenue risk Tolling technology Overloading control Traffic/Incident management Cost overrun Risk
06	Transfer risk	1 2	No residual value Transmission failure
07	Financial risk	1 2 3 4 5 6	Inflation rate volatility Interest rate volatility Financial closure risk Poor financial market Demand/Market risk High cost of financial Risk
08	Commercial risk	1 2 3 4	Traffic/Level of demand risk. Non completing facility. Lack of demand/slow economic development of the country. Delay by government notification of toll collection.
09	Lenders Risk	1	Default of the concessionaire
10	Force majeure	1 2 3 4	Social unrest problem Natural calamity Historical findings Rebellion/Terrorism

Formulation of the Questionnaire

To know the impact of the risks on the project deduced from the study of the literature review questionnaires were formulated and distributed. The questionnaire comprises a list of the risks or constraints and measured them on a five-point Likert scale from 1 being very low, 2 being low, 3 being moderate, 4 being high and 5 being very high. This scale is used to in this questionnaire because of its ease of understandability and because of totality it offers in its simple means and it gives a clear view of the agreement or disagreement of the respondent. The questionnaire is designed to study the views of respondents on the extent to which these risks affect their projects.



No.	Risks	Factors in Field	From Field
1	Regulation, Social & Legal risk	Land acquisition	✓
2	Support from local government	Support from local public	✓
3	Force Majeure	Natural calamity	✓

Mitigation Measures

Sr. no	Risks	Factors of Origin	From Field
1	Regulation, Social & Legal risk	Land acquisition	Interfacing with concerned departments to ensure land approvals in place or face least obstacles. Community consultations to ensure least resistance from local population. Ensure Concession Agreement deal with the approval issues – for example, making certain critical approvals ‘conditions precedent’ to the agreement/commencement of construction.
2	Support from local government	Support from local public	Addressing all environmental issues before the bid process, including impact assessment. Subordinate loan by government. Maintain good relations with government and a positive public image of the project.
3	Force Majeure	Natural calamity	Obtain government’s guarantees to adjust tariff or extend concession period. Insure all insurable force majeure risks. Obtain government’s guarantee to provide finance help if needed.
4	Construction risk	Cost overrun	Contractor's All Risk (CAR) Policy. Escalation Clause. Price Contingency in the Bid.
		Time overrun	Scheduling the milestones on a target phase divided by the total time frame given. Checking the pace of the work on the timing interval, analysis and a report of the same situation of concern must be addressed on an urgent basis.

The present research concludes that the variety of risks those are generated in case of the HAM Road project are Political Risk, Regulation, Social and legal risk, Support from government, Force majeure, Construction risk, Operation



and Maintenance (O & M) risk (includes Revenue risk), Transfer risk, financial risk, Commercial risk, Lender's risk etc. every risk specified has source of origin.

The road projects in India were not being completed on the time due to certain problems like toll collection risk, traffic risk which had to be borne by the concessionaire. Also, there was a problem of rising bad loans of banks because of which banks were not willing to lend. These all factors led to delay in completion of road construction projects. So, in order to give a boost to the construction sector, government launched hybrid annuity model which is an improvement over the existing models. It will eliminate the problems being faced under the existing models and will ensure that the projects are completed on time. But it seen that there are various risks arises during completion of that HAM road project. So this research mainly focuses on the type of risks associated with HAM road project and the different mitigation measures to overcome such a type of risks.

The risk management framework proposed by this research project will be easier to apply than others. It incorporates the findings from this research and provides step-by-step guidelines for companies who intend to invest in HAM infrastructure projects in the future. It also has the potential to help national, provincial, and city government to examine their approach to and services in support of HAM infrastructure projects. It suggests that mechanisms be reviewed to improve the communication and coordination links between different levels of government, that thought be given to developing mechanisms to co-ordinate actions by different government agencies and that the lessons learned from individual HAM projects be shared among government servants so that unintended barriers to HAM are dismantled.

V. CONCLUSION

The risk management framework proposed by this research project will be easier to apply than others. It incorporates the findings from this research and provides step-by-step guidelines for companies who intend to invest in HAM infrastructure projects in the future. It also has the potential to help national, provincial, and city government to examine their approach to and services in support of HAM infrastructure projects. It suggests that mechanisms be reviewed to improve the communication and coordination links between different levels of government, that thought be given to developing mechanisms to co-ordinate actions by different government agencies and that the lessons learned from individual HAM projects be shared among government servants so that unintended barriers to HAM are dismantled.

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