International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 9 Issue 7 ǁ 2021 ǁ PP. 52-57

Risk Analysis and Management in MDR Construction Projects in Kerala

[1]Vidya V, [2]Anju k
[*1]*Department of civil Engineering, APJ Abdul Kalam Technological University, Thiruvananthapuram, Kerala*
[*2]*Department of civil Engineering, APJ Abdul Kalam Technological University, Thiruvananthapuram, Kerala*

Abstract
*In the implementation of MDR construction projects always risk arise. These risks have greater impact on the execution of the projects, the community of road users and the surrounding environment. These risks have to be studied, managed and assessed as a risk-mitigation effort. Risk identification is thus the first step in risk management process. Descriptive method used in this project identification of variable risk using considering social, technical, economical, political, legal and environmental risks. And also by considering the contemporary risk factor Covid 19 pandemic risks. It is a good way of ensuring one has captured all potential risks and issues. The factors is identified through literature review and used as a questionnaire instrument. Remedies are made based on the findings and also the impact of these remedies are identified by questionnaire survey. This project aim to handle the critical risk factors in future, that results in the successful **c**ompletion of the MDR construction projects.*

Keywords: *MDR, Risk-mitigation, Risk management, Risk identification*

Date of Submission: 21-06-2021 Date of acceptance: 06-07-2021

I. INTRODUCTION

Construction industry is an important industry that plays a major role in economic growth of a nation. It is necessary to complete within specified duration, budget and required quality expected without any risk. The majority of industry work is related to highway, road and street construction. New highway and street construction typically involves seven stages of development: planning, design and project administration; clearing and earthworks; alterations to public utilities; drainage, structures; paving and surfacing and project finishing. Different types of risks are associated with each and every stages of construction.

It may not be possible to identify all risk but if identified earlier at a preliminary stage it can help to make a project successful, making revenues for all project participants. Effective governance and risk management is the key to success for any project in current scenario and thus very important to be considered in the project. Various researchers have tried to identify different risk factors that can hinder the completion of a project successfully in different parts of the world. Every road construction project include some degree of risk and most of the managers are not prepared to identify potential risk sources when it comes to on field application and also identifying all risk factors associated with a project is a time consuming and counterproductive task thus attempts to identify risk factors on field are doomed to fail in Indian road construction industry. In this research, factors were identified that hinders the successful completion of road construction project. And the impacts of the identified factors were studied. Remedial measures are suggested to control these risk factors for the successful completion of the road construction projects.

1.2 Objectives

The main objectives of this project are the following;

- To find different risk factors in MDR construction projects in Kerala
- To analyze those factors to find critical factors and to rank those factors
- To study the impact of risks
- To make suggestions for the minimization and control of risks.

1.3 Scope

Scope of this study include;

- Effect of risks on project time and finance is identified
- Drive attention to the occurrence of unpredictable risk
- Strength, weakness, opportunity and threat of projects can be identified
- Future projects can be completed as per the schedule

II. METHODOLOGY

The project methodology is a way to systematically solve the research problem. It deals with the objective of a research study, the method of defining the research problem, the type of data collected, method used for data collection and analyzing the data etc. the methodology of this project include;

1. Problem statement
2. Literature review
3. Questionnaire design
4. Data collection
5. Data analysis
6. Results and discussion
7. Conclusion and suggestions

2.1 Questionnaire Design

The questionnaire design took into consideration the objectives of the study with the aim to answer the research questions. Great effort and brainstorming were done for designing the questionnaire. Meetings with members from the industry were conducted to identify the right questions required and to present them in a clear and an unambiguous format. Special care also was done for phrasing the questions that is easily understood by respondents. The questionnaire was prepared considering Social, Technical, Economical, Political, Legal, Environmental and Covid 19 risk factors.

2.2 Questionnaire Structure

In Questionnaire the experts have been asked to comment on the impact of Risk i.e., severe (S), High (H), Medium (M), Low (L) and Very Low (VL).

III. DATA COLLECTION

Data collection is done by site visit and questionnaire survey. Different risk factors in Major District Road (MDR) construction projects were identified through detailed literature review. 40 major risk factors were identified from the study. Datas were collected from 10 MDR construction sites. Responses are taken from Project engineer, Assistant engineer and Contractor staff respectively. Remedial measures were identified for the risk factors which have more impact on construction sites. Also questionnaire survey is conducted to find out the impact of these remedial measures. The social, technical, economic, political, legal, environmental and covid 19 pandemic risk factors and the responses from the data collection on the impact of these risk factors are obtained from the data collection.

IV. DATA ANALYSIS

The datas obtained from questionnaire survey is analysed to find the critical factors and to rank those factors. And also to find suggestions or remedial measures for the risk factors which have major impact on the MDR construction sites. Ranking is done by using software Ms Excel. The method used for ranking is descriptive analysis using ranking scale data.

4.1 Ranking of Social Risk Factors

Table 1 shows the ranking of Social risk factors

Table 1 Ranking of Social Risk Factors

SOCIAL RISKS	TOTAL	RANK
Delays due to labor holidays	69	4
Traditional ceremonies around the project	65	6
Lack of good coordination in the project	129	1
Labor strike when the task is going	81	3
Lack of awareness of project workers on work safety and security	99	2
Accidents that occur in locations that cause injury	67	5

4.2 Ranking of Technical Risk Factors
Table 2 shows the ranking of Technical risk factors

Table 2 Ranking of Technical Risk Factors

TECHNICAL RISKS	TOTAL	RANK
Change in the scope of work	119	3
Poor geotechnical condition	125	2
Poor contract management/ non-performance of vendors/ subcontractors	112	4
Availability of Labour/ Material	78	6
Unproven technology /design deficiency	132	1
Incompatibility between work volume in the contract and field conditions	106	5

4.3 Ranking of Economic Risk Factors
Table 3 shows the ranking of Economic risk factors

Table 3 Ranking of Economic Risk Factors

ECONOMIC RISKS	TOTAL	RANK
Market unpredictable risk	126	2
The occurrence of inflation during project implementation affects material prices	121	3
Tolling technology	67	6
Overloading control	68	5
Traffic/Incident management	116	4
Cost overrun Risk	127	1

4.4 Ranking of Political Risk Factors
Table 4 shows the ranking of Political risk factors

Table 4 Ranking of Political Risk Factors

POLITICAL RISKS	TOTAL	RANK
Change in legislation /policy	110	3
Termination of agreement by govt.	130	2
Attitude of govt. toward foreign investor/ investor	108	4
Imposition of new taxes/ increase in taxes	108	4
Lack of coordination between relevant agencies in decision making	135	1

4.5 Ranking of Legal Risk Factors
Table 5 shows the ranking of Legal risk factors

Table 5 Ranking of Legal Risk Factors

LEGAL RISKS	TOTAL	RANK
Change in Law	98	5
Change in regulation	100	4
Environmental Clearance/ Pollution	104	3
Land acquisition/ compensation/ Social impact assessment	147	1
Lawsuit from within and from outside	113	2

4.6 Ranking of Environmental Risk Factors
Table 6 shows the ranking of Legal risk factors

Table 6 Ranking of Environmental Risk Factors

ENVIRONMENTAL RISKS	TOTAL	RANK
The influence of a bad community environment	125	4
Difficult access to entry for heavy equipment to be used during project implementation due to congestion	131	2
Disruption of smooth work due to the high level of traffic density around the project site	132	1
Project delays due to weather (rain, wind)	95	6
Damage due to natural disasters: storms, floods, and earthquakes	108	5
Unexpected soil conditions	127	3

4.7 Ranking of Covid 19 Pandemic Risk Factors

Table 7 shows the ranking of Legal risk factors

Table 7 Ranking of Covid 19 Pandemic Risk Factors

COVID 19 PANDEMIC RISKS	TOTAL	RANK
Physical well being and safety of project participants	129	3
Quarantine problems	137	2
Work disruptions due to pandemic	150	1
Labor migration	110	5
Commercial/financial issues	122	4
Maintenance of covid protocol	107	6

V. CONCLUSIONS

Different risk factors in Major District Road (MDR) construction projects were identified through detailed literature review. 40 major risk factors were identified from the study. Questionnaire were prepared based on the identified risk factors. Different MDR in Kerala were listed. Based on questionnaire survey datas were collected. Datas were collected from 10 construction sites. Three responses are taken from each construction sites. The responses are collected from Project engineers, Assistant engineers and Contractor representative.

From the data collection and analysis it is found that, all the identified risk factors have heavy impact on the project life that affect the time, cost, quality, scope etc. of a project. And it also affect the project goals and objectives. Successful completion of project is disrupted due to these risk factors. COVID 19 pandemic risks are found to be the critical risk factor that have major impact on constructions projects. Work disruptions due to pandemic is found to be the most occurring risk factor under Covid 19 pandemic risks category. Also the legal risk factor land acquisition is found to be severe in most cases.

The social risk factors that have major impact on the construction projects are, Lack of good coordination in the project and Lack of awareness of project workers on work safety and security. Unproven technology /design deficiency and Poor geotechnical condition are the most occurring technical risk factors. Most influenced economic risk factors are Cost overrun Risk, 68 Market unpredictable risk and The occurrence of inflation during project implementation affects material prices. Political risk factors that have major contribution are, Lack of coordination between relevant agencies in decision making and Termination of agreement by government. Legal risk factor Land acquisition have huge impact. Environmental factors that have more impact are, Disruption of smooth work due to the high level of traffic density around the project site, Difficult access to entry for heavy equipment to be used during project implementation due to congestion and Unexpected soil conditions. Work disruptions due to pandemic and quarantine problems have more impact on construction projects.

Remedial measures/suggestions for these risk factors were identified. Questionnaire survey is conducted to find the impact of these suggestions in MDR construction projects. It is found that these measures are not regularly following by the construction sites and no construction project is provided with a risk management team. Lean construction is found to be good in controlling risks, but it is not following in the construction sites. These suggestions should be strictly follow up in the projects for the successful completion of the project. And it will be helpful for handling critical risks in future.

VI. SUGGESTIONS

From the data analysis it is found that no construction sites is following the risk mitigation techniques. It should be followed up for controlling or eliminating the impact of these risk factors. No construction project is having a "Risk management team". The first recommendation for the elimination and control of the risk factors is to build a "Risk Management" team for all construction projects. Next one is to adopt "Lean Construction" techniques. "Lean construction" is found to be good in controlling risks, but it is not following in the construction sites. Other suggestions provided are,

- Regular meetings with all project participants.
- Online programmes related to work updations for project participants.
- Provide training and awareness classes for risk management.
- Safety evaluation indicator is provided for safety management.
- Proper site inspection and investigation by design wing.
- Arrange labs in construction sites for material testing.
- Do proper land study and CBR test at the initial stage.
- Maintain works are as per proper schedule and estimate.
- Project planning and execution against cost over run risks.
- Better understanding of contractors before selection.
- Give compensation as per market value
- Do planning and design process to avoid land acquisition problems.
- Seek help from local arbitrator.
- Maintain relationship with local people who is politically strong.
- Arrange day-night work.
- Select diversion roads before the construction begins.
- Planning and execution of project is arranged considering weather forecast.
- Provide vaccination priority for all project participants.
- Arrange quarantine facilities in the construction site.
- Provide temperature checking and sanitization facilities.
- Arrange alternate working days for workers.

REFERENCES

[1]. Varun Raj V, Ajith P M (2018), "Risk Factors Affecting Building Construction Projects In India", International Journal of Engineering Technology Science and Research, Volume 5, Issue 1, pp: 1651-1656

[2]. Pawel Szymanski (2017), "Risk management in construction projects", ScienceDirect, pp: 174-182

[3]. Subya R, Manjusha Manoj (2017), "Risk assessment of highway construction projects using fuzzy logic and multiple regression analysis", International Research Journal of Engineering and Technology, Volume 4, Issue 4, pp: 2344-2349

[4]. Mayank Kumar Singh, Shumank Deep, Rjeev Banarjee (2017), "Risk management in construction projects as per Indian scenario", International Journal of Civil Engineering and Technology, Volume 8, Issue 3, pp: 127-136

[5]. Anil Kumar Gupta, Dr. M K Trivedi, Dr. R Kansal (2017, "Risk variation assessment of Indian road PPP projects", International Journal of Science, Environment and Technology, Volume 2, Issue 5, pp: 1017-102

[6]. B Vidivelli, Vidhyasagar , K Jayasudha (2017), "Risk Analysis in Bridge Construction Projects", International Journal of Innovative Research in Science, Engineering and Technology, Volume 6, Issue 5, pp: 8271-8284

[7]. Viraj Konde, Pravin Minde (2017), "Identification and Assessment of Risks in Construction Projects: A Case of Pune City", International Journal of Engineering Science and Computing, Volume 7, Issue 10, pp: 15247-15250

[8]. Jianyou Zhao, Xiaoyu Fu, Yunjiao Zhang (2016), "Research on risk assessment and safety management of highway maintenance project", ScienceDirect, pp: 434-441

[9]. Shahabas S, Sivaprakash G (2016), "Study on regression techniques on the risk modelling in highway projects using fault tree analysis and recommendations for rectification", International Journal of Innovative Research in Science, Engineering and Technology, Volume 5, Issue 2, pp: 2475-2482

[10]. Aitwar Vishambar, Sontakke Kaustubh, Patel Karthik, Ashwini Salunkhe (2016), "Risk planning in construction of highway project: case study", International Journal of Latest Research in Engineering and Technology, Volume 2, Issue 3, pp: 57-63

[11]. Dr. R R Singh, Gopesh Chugh (2016), "Various risks involved in highway projects", International Journal for Innovative Research in Science & Technology, Volume 3, Issue 6, pp: 131-135

[12]. T H Nguyen G Bhagavatulya F Jacobs (2016), "Risk Assessment: A Case Study for Transportation Projects in India", International Journal of Application or Innovation in Engineering & Management, Volume 3, Issue 9, pp: 1-14

[13]. Anmol Okate Dr. Vijay Kakade (2016), "Risk Management in Road Construction Projects: High Volume Roads", International Journal of Application or Innovation in Engineering & Management, Volume 5, Issue 3 pp: 1-4

[14]. Barbara Gladysz, Dariusz Skorupka, Dorota kuchta, Artur Duchaczek (2015) "Project risk time management – a proposed model and a case study in the construction industry", ScienceDirect, pp: 24-31

[15]. Herry Pintardi Chandra (2015), "Structural equation model for investigating risk factors affecting project success in Surabaya", ScienceDirect, pp: 53- 59

[16]. Sameh M El Sayegh, Mahmoud H. Mansour (2015) "Risk Assessment and Allocation in Highway Construction Projects in the UAE" ASCE, Volume 31, Issue 6, pp: 1-10

[17]. Mr. N.V Patil, Dr. P.G Gaikwad (2015), "Risk management in road construction", International Journal of Modern Trends in Engineering and Research, Volume 4 , Issue 2 , pp: 851-856

[18]. Mubin M Shaikh (2015), "Risk management in construction projects", ScienceDirect, pp: 150-155

[19]. Chaitali S Pawar, Suman S Jain, Jalinder R Patil (2015), "Risk management in infrastructure projects in India", International Journal of Innovative Research in Advanced Engineering, Volume 2, Issue 4, pp: 172-176
[20]. Mahmoud Mohammed Mahmoud Sharaf, Hassan T Abdelwahab (2015), "Analysis of risk factors for highway construction projects in Egypt", Journal of Civil Engineering and Architecture, Volume 3, Issue 2, pp: 526-533
[21]. Dai Q. Tran, Keith R. Molenaar (2014), "Impact of Risk on Design-Build Selection for Highway Design and Construction Projects", ASCE, Volume 30, Issue 2, pp: 153- 162
[22]. M.G Bhandari, Dr. P.G Gayakward (2014), "Management of risks in construction projects in Maharashtra", International Journal of Engineering Science Invention, Volume 3, Issue 1, pp: 14-17
[23]. Saman Aminbakhsh, MuratGunduz, RifatSonmez (2013), "Safety risk assessment using analytic hierarchy process (AHP) during planning and budgeting of construction projects", ScienceDirect, Volume 46, Pp: 99-105
[24]. Garry D. Creedy, Martin Skitmore, Johnny K. W. Wong (2010), "Evaluation of Risk Factors Leading to Cost Overrun in Delivery of Highway Construction Projects", ASCE, Volume 136, Issue 5, pp: 528-537