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"Risk Assessment in Ongoing Construction of Mumbai Metro Rail Project"

Mr. Abhishek Awasarkar[1], Dr. Prof. Arun Kumar Dwivedi[2]

Civil (Construction Management) M. Tech, Sandip University, School of Engineering and Technology, Mahiravani, Nashik-422213

Abstract: There is a certain risk associated with every construction project, which needs to be properly mitigated for good execution. Risk management is a very important parameter for a project to be successful. Most of the time, there are three phases involved in treating a disc, namely risk assessment identification and risk response. A risk management implementation must take all these prices into account so that there is no major impact on the quality or time to cost of completing the project. De-risking the project is very important so that there is no dispute between the contractor or the client and at the same time it leads to the reduction of risk in both cases. As the city of Mumbai is undergoing a huge infrastructure development and the Mumbai metro will be an iconic project undertaken by the government. This article is about the identification of risk factors involved in the Mumbai metro project. In this paper, various factors involved in risk management have been studied and the results are presented for mitigating the risks associated with the Mumbai metro construction project.

***Key Words*:** Risk, Mumbai, metro and factors.

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1. INTRODUCTION

Greater Mumbai is the capital of the geographical area and the center of economic and trade activities of the Asian country. It has become a victim of its own success, with four-fold growth of population since 1951 being accommodated in the suburbs, while the highest concentration of jobs has remained in the Island town. The physical characteristics of the town are such that the suburbs are affected to unfold northerly only, and every transport facility is focused among 3 slender corridors. This has placed a lot of stress on all modes in operation in these corridors. The ever-growing transport and rider demands include constraints on capability.

The government of the geographical area has adopted a variety of policies to alleviate the chaotic condition of the present network. These include the event of Navi city and Bandra – Kurla advanced, which has attracted a million people and provided two 100000 jobs outside larger city. Construction risks, such as style changes and unforeseen climatic conditions, result in time and price overruns. Financial risks are best borne by the non-public sector, while legal risks stem from weak implementation of restrictive commitments. Operating risks involve tragedy risks, like fire or earthquakes, or non-political factors like strikes and industrial disturbances that impair the project's ability to earn revenues. Non-public insurance is becoming obtainable for ruinous risks, but public sector is two-faced with the requirement to structure. The present work deals with the detailed analysis related to the metro project as well as the risk management involved in this project for the Mumbai metro project.

1.1. Problem Statement

Understanding and addressing the risks of a construction projects early on are important to protecting our financial exposure as well as that of our clients. Promoters would invest in a project only if the risks in the project are less than the reward which the project fetches. Construction projects carry several risks that are unique to this type of delivery system in addition to the risks associated with more traditional assignments.

1. Delays in land Acquisition
2. Planning
3. Regulatory, administrative & approval delays
4. Design Risk
5. Construction Risk
6. Change in Scope Risk
7. Financing Risk
8. Technology Risk
9. Operations & Maintenance Risk
10. Market Risk
11. Force Majeure
12. Political and social risks

1.2. Objective of Study

1. To Identify various risks in metro project.
2. To Assess impact of those risk in metro project.
3. To Mitigative identified risks in metro project.

2. LITERATURE REVIEW

Debasis Sarkar and Goutam Dutta [2011] developed a framework of project risk management for the underground passageway construction of metro ways. They used the mean technique (EVM) to measure project risk and quantified the risks in terms of probability, impact, and severity. They found that the project cost and time overrun may be concerning 22.5 % and 23.4 % respectively.

A.Suchit Reddy (2015) investigated to acquire an overall idea about risk and its consequences in the construction field and the process required for its management. The objective of the research topic was to explore the effective way for implementation of risk management in the construction industry, consider the different types of risk management techniques applied to alleviate risk, identify the use of implementation of the risk management, determine the factors that can influence the applications of risk management in the project life cycle, and categorize the principles adopted in Risk Management. A survey was conducted to identify, characterize, and assess threats involved in the construction industry, assess the vulnerability of critical assets to specific threats, determine the risk (i.e., the expected consequences of specific types of attacks on specific assets), identify ways to reduce those risks, and prioritize risk reduction measures based on a strategy.

K. Jayasudha and B. Vidivelli (2016) conducted a study to examine the awareness of professionals in the construction industry of the various types of planning techniques and tools used on construction sites. Questionnaires were administered to selected building professionals (Project Managers, Engineers, Architects), and Contractors and Sub-contractors directly involved in construction work on sites in planning and the use of planning tools and techniques as major tools for successful project execution. The results showed that there is low awareness on the functional use of construction planning tools and techniques and recommended that the use of the construction planning tools and techniques should be applied in all building projects and there should be regular adequate training of professionals on the effectiveness and improvement in Information Technology in the construction industry.

3. RESEARCH METHODOLOGY

Risk is assessed either through analysis. Qualitative risk analysis includes various techniques for assessing the impact and likelihood of a known risk. These approaches tend to position risks according to their potential impact on project objectives and are a way of seeing the importance of addressing specific risks and managing risk responses.

Quantitative analysis uses scales of numerical quantitative relationships for probabilities and consequences instead of descriptive scales. There are several risk analysis and risk control tools on the market, ranging from expert knowledge - basic judgment, checklists and risk matrices to expert reviews and analytical techniques. Risk is assessed by estimating the likelihood of risk and impact on simple scales, such as one to five or high to low. Risks are mapped in a very random - impact grid. In the network, the risks that require the highest attention are easily detectable, with measures taken to manage them, provided that there are convenient resources, or if the mitigation of the chance, the prices are only a product of the coincidence of the occurrence of the risk and its impact on the project goal.

4. CASE STUDY ON MUMBAI METRO LINE – 3

Mumbai Metro Line 3 is a 33.5 km long, fully underground metro corridor connecting Cuffe Parade to Kanjumarg. The line, granted autonomy by MMRDA, covers 28 stations and allows commuters to interchange with other lines. Construction began on October 21, 2016, but faced legal disputes, causing delays. The project began full scale on May 18, 2017. Mumbai Metro Line 3 is expected to complete the first phase of the Bandra-SEEPZ Metro corridor by January 2024, but the project will take six more months to start phase-1 if the Metro car shed land issue is resolved within three months.

The initial plan was to complete the first phase by December 2021 and the second phase by June 2022. The project's delay may make it unlikely to be completed by 2024. An extension of 2.5 km to Navy Nagar from Cuffe Parade is also proposed, costing an additional ₹2,301 crore.

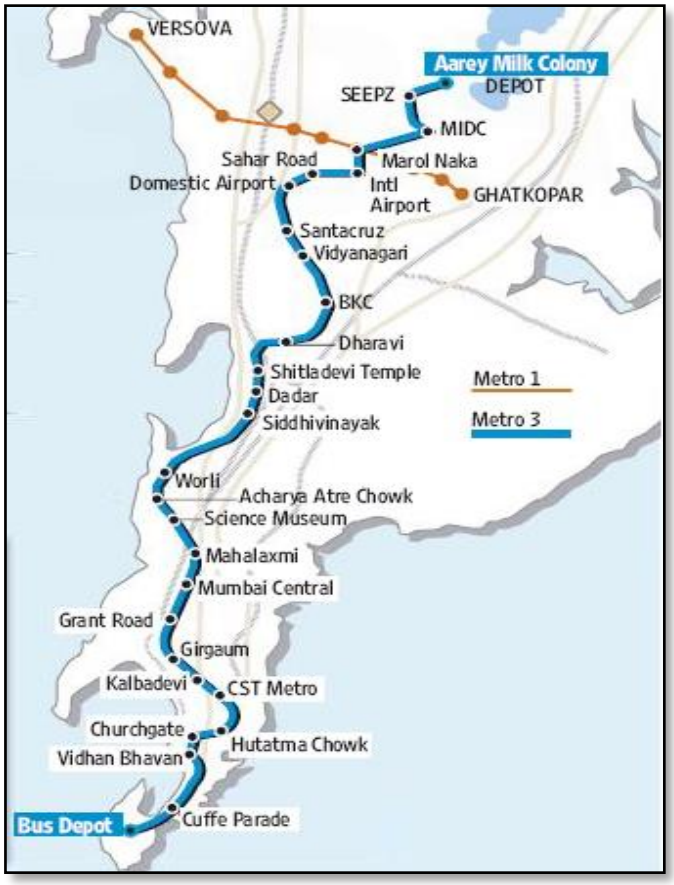

Fig. Map of Mumbai Metro Rail Line-3

4.1 Risk while construction in progress

1. Labours working without proper PPE, this may cause unwanted fatal accidents on site while working.
2. Workers consuming narcotic substances while working can cause disturbance on site & can also cause unwanted accidents while working.
3. Workers at height working without working platform, full body harness not anchored while working on height.
4. During the site visit it was observed that the subcontractor was creating a situation for not adhering OHSE person's instruction. Failed to conduct toolbox meeting. Failed to conduct supervision, labours roaming at site without proper PPE.
5. Alcohol consumption by labours on site
6. Dumping of excavated muck on road without taking any instruction from responsible Engineer
7. Found working without safety harness, poor supervision, permit system not followed.
8. Fatal injuries occurred while working on site, due to internal disputes among labours.

4.2 Safety Required during construction in progress

1. The most important thing is that such a big project is not having provisions of CCTV on site, much of above problems would have been solved just by installing of CCTV on various places.
2. It is also observed that the security provided on site are very careless, that they allow the labours on site without checking their PPE, i.e., helmet, Safety shoes, etc.
3. Security not even checking that is the labour entering the site is drunk or not.
4. Employer can also generate the revenue just by controlling the risk on site by penalizing the individuals who does not maintain the safety measures on site.
5. So, maintaining safety and controlling of risk is also important for both Employer and subcontractors on site.

5. RESULTS OF SURVEY

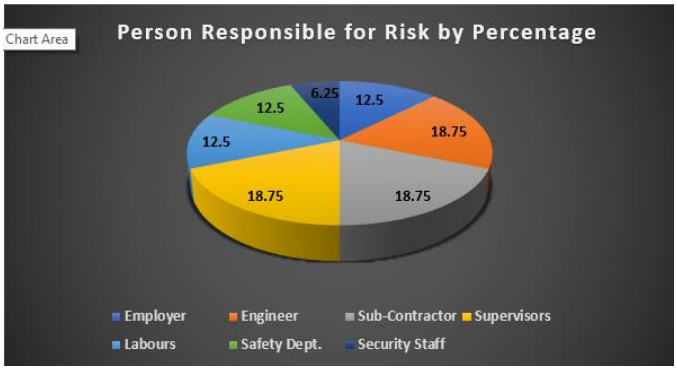

Fig. Persons Responsible for Risk by Percentage

5.1 Observations

1. Effective management control will raise the standard of your health and safety measures.
2. People often think that incidents occur due to negligence or employee mistakes. Still, most incidents in the workplace occur due to insufficient management controls.
3. Your proactive effort to implement risk management systems can prevent the majority of incidents that may occur in your workplace. The following are examples of systems to put into place in your workplace to reduce the likelihood of a health and safety incident.
   - Training.
   - Inspections.
   - Work procedures.
   - Employee fitness.
   - Planned maintenance of equipment and structures; and
   - Ensuring sufficient and competent supervision.

A hazard identification and risk assessment process is a proactive one. It is more cost-effective to complete this process and implement a risk management system than to have an incident on-site and then create the risk management systems retrospectively.

5.2 Advantage of Risk Assessment

1. Smooth functioning of activities and timely completion of project leading to great success and profit to the company
2. No loss of life, no injuries and no distraction while working on site for workers.
3. Creating awareness about safety on the site amongst the workers and using it as the training tool.
4. Saving project cost and increasing profit just by being proactive instead of being reactive.

6. CONCLUSIONS

An effective risk management method encourages the development company to identify and quantify risks and consider risk mitigation and risk mitigation policies. Construction firms that manage risk effectively and efficiently enjoy money savings and higher productivity, higher success rates for the latest products, and higher cognitive processes. The results of the analysis show that the higher than equal construction company takes over significantly from the development firms in the Republic of India in adopting risk management practices. To effectively and efficiently manage the chance, the contractor should perceive risk responsibility, risk event conditions, risk preferences and risk management capabilities. In construction project risk management, risks are also compared by entering them into a risk versus chance impact matrix. the opportunity management framework for construction will be enhanced by combining qualitative and quantitative methodologies with risk analysis.

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