

# A Review of Disaster Management Strategies during Construction Operation in Monorail Project

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**Abstract**— Development period of Monorails are inclined to various debacles that can emerge normally or through human mediation. The wellbeing of development operation gets to be distinctly most extreme significance for the Monorails to work appropriately. The review concentrated on ID of different catastrophes and the risks related with them. The calamities can be seismic tremor, surges, storm, extraordinary temperature, fire episode, dread assault, flawed development techniques and so forth. The effect and weakness examination of these debacles is directed to discover the related risks appropriately. Relieving risks is as essential as recognizing them. The two most essential risks distinguished are Design Risk and Risk amid execution. The readiness to these risks helps in relieving them. A probabilistic disastrous risk show has been distinguished which plays out a money saving advantage examination for moderating the risks.

**Keywords**— Disaster management, Monorail, Natural Disaster, Manmade Disaster, Disaster risk reduction.

## I. INTRODUCTION

A fiasco is a genuine interruption of the working of a group or a general public including broad human, material, financial or ecological misfortunes and effects, which surpasses the capacity of the influenced group or society to adapt utilizing its own particular assets. In contemporary scholarly community, debacles are viewed as the result of improperly oversaw risk. These risks are the result of a blend of both perils and helplessness. Dangers that hit in regions with low weakness will never get to be debacles, as on account of uninhabited locales. Human-induced debacles are the outcome of mechanical perils. Illustrations incorporate charges, fires, transport mishaps, mechanical mischances, oil slicks and atomic blasts/radiation and so forth.

Perils can be grouped into three classes as indicated by their tendency:

- i. Technological dangers are those unplanned disappointments of outline or management influencing extensive scale structures and transport frameworks, or modern exercises that present life debilitating risks to the nearby group.
- ii. Natural dangers result from those components of the physical environment unsafe to Man and brought on by powers incidental to him.
- iii. Human-actuated regular dangers are those that are brought on by the human change of nature.

## II. LITERATURE SURVEY

1. **George Ofori, Construction industry improvement for fiasco aversion and reaction, National University of Singapore** -Fiascos, both Natural and Human-brought on, have been happening with expanding recurrence and impact in late decades in numerous nations around the globe. They have had an excessively substantial toll on creating nations both as far as loss of lives and harm to property. The need to make a move to viably oversee catastrophes has been highlighted at many real global gatherings and measures are in progress in numerous nations and at the universal level.
2. **Jeannette Sutton<sup>1</sup> and Kathleen Tierney<sup>2</sup>, Disaster Preparedness: Concepts, Guidance, and Research, Institute Assessing Disaster Preparedness Conference Sebastopol, California, November 3 and 4, 2006**- Readiness for calamities is basic for family units, organizations, and groups, however many stay ill-equipped. As late fiascos serve to highlight the requirement for individual obligation, neighborhood coordination, and progression arrangements to guarantee the capacity to react to and recuperate from significant occasions, the central government

has organized national readiness as an objective without building up a framework to accomplish and look after it. Moreover, open substances have been accused of surveying their condition of status and distinguishing qualities and territories of shortcoming as a prerequisite for getting government financing and Homeland Security gifts.

3. **Deshmukh Azhar A.1 and Prof. P. P. Bhangale<sup>2</sup>, Disaster management for cooling tower – contextual investigation, 2016** - Calamities are an excessive amount of old as mankind's history however the sensational increment and the harm brought about by them in the current past were gets to be reason for national and global concern. Over the previous decade, the quantity of characteristic fiascos and artificial debacles has climbed colossally. Fiasco now is considered as the principle deterrent in the security and maintainability of the nation it causes tremendous misfortune to life, material and environment.
4. **Government of India Ministry of Home Affairs National Disaster Management Division, Disaster Management in India-A status Report, 2004** - India has been generally powerless against characteristic calamities because of its special geo-climatic conditions. Surges, dry seasons, violent winds, tremors and avalanches have been repetitive marvels. Around 60% of the landmass is inclined to seismic tremors of different forces; more than 40 million hectares is inclined to surges; around 8% of the aggregate range is inclined to violent winds and 68% of the zone is defenseless to dry spell. In the decade 1990-2000, a normal of around 4344 individuals lost their lives and around 30 million individuals were influenced by catastrophes consistently. The misfortune as far as private, group and open resources has been galactic.
5. **Leonidas G. Anthopoulos<sup>1</sup>, Efrosini Kostavara<sup>2</sup>, John-Paris Pantouvakis<sup>3</sup>, An Effective Disaster Recovery Model for Construction Projects, 2013**- Different unwelcome circumstances can happen amid the execution of a development venture, which depend on regular wonders (i.e., tropical storm, surge, seismic tremor and so forth.), on socio-political conditions (i.e., war, political emergency, budgetary retreat and so on.), on specialized and many-sided quality reasons (i.e., unpracticed laborers' flaws) or even because of site's conditions (i.e., ground disappointments). Each of the undesirable circumstance can make harms the venture, which fluctuate from postponements, developed expenses and changes, to finish cancelation (i.e., in instances of whole site's annihilation). These unwelcome wonders are called fiascos (Blackhard, 2006), "emergencies" (Loosemore, 1999) or "disappointments" (Kerzner, 2011). Fiascos change as indicated by their sources, to their size and to their impacts on a venture, while a venture could recoup from a calamity that does not influence its definition and achievability.

### III. CONSTRUCTION DISASTERS

#### 1. Overview

As the development business is done in risky situations, it encounters mishaps in various levels of seriousness, some bringing about minor and significant wounds with even some subsequent in casualty. Notwithstanding the human cost included, it likewise causes terrible attention to the calling. Around the world, specialists have taken care of security measures, which have upgraded the execution in development destinations. Be that as it may, mishaps are as yet incident and there is a requirement for further research on this critical subject.

The primary destinations are as per the following;

- (i) To research development site mischances to distinguish the basic circumstances and end results; and
- (ii) Establish relationship of mischances with extra venture cost, extra time, extend scope, organization notoriety, and effect on national wellbeing files. While human blunders were distinguished as the primary driver for development mishaps, carelessness or mix-ups can occur because of the dubious conditions.

The most widely recognized perils in the development ventures are:

- i. Lifting and pushing - e.g. taking care of substantial or ungainly estimated objects.

- ii. Slips, trips, fall - e.g. slipping on a wet surface or tumbling from a stepping stool.
- iii. Using hand apparatuses, for example, control devices, saws, scoops and crow bars.
- iv. Noise from hardware, for example, solid cutters, penetrates and saws
- v. Atmospheric contaminants, for example, tidy, manufactured mineral filaments and asbestos.

The shot that these perils will bring about a damage for youthful laborers is higher when they are joined with risk components, for example,

- i. Lack of supervision
- ii. Lack of preparing
- iii. Being ignorant about their rights
- iv. Trying to awe the manager, boss or collaborators.
- v. Temporary business.

## 2. Accidents and its Causes

A mischance can be characterized as a spontaneous, undesirable, sudden, and uncontrolled occasion. A mischance does not really bring about a harm. It can be in term of harm to gear and materials and particularly those that outcome in wounds gets the best consideration (Hinze, 1997).

### 2.1 Accident Causation Models

Mischance causation model is not another model to distinguish the root issue of security in development and other industry. The goal of this model is to give instruments to better modern mishap aversion program (Abdelhamid and Everett, 2000). As depicted by Heinrich (1980) mishap aversion is an essential program, a progression of organize exercises, coordinated to the control of dangerous individual execution and hazardous mechanical conditions, and in light of certain learning, demeanors, and capacities.

### 2.2 Domino Theory

Mischance causation model was spearheaded by Heinrich in 1930, which talked about mishap causation hypothesis, the collaboration amongst man and machine, the demonstrations, the management part in mischance anticipation, the expenses of mishap, and the impact of security on productivity.

### 2.3 Multiple Causation Model

This model was introduced by Petersen in 1971 that has very surprising idea with the domino hypothesis that affected numerous specialists amid Heinrich time. This model was enlivened by his trusted that many contributing variables, causes, and sub-causes are the principle offenders in a mishap situation. Under this idea, the components consolidate together in arbitrary design, bringing on mischances.

## 3. Human Error Theories

The approach of this hypothesis is indicated the specialist as the primary element of the mischance. This approach as said by Abdelhamid (2000) studies the inclination of people to make blunder under different conditions and circumstances, with the accuse generally succumb to human(unsafe) attributes as it were.

## 4. Causes of Accident

Mischance don't simply happen, they are brought about. As per Ridley 99 for each penny of the mischance are brought about by either hazardous acts or perilous conditions or both (Ridley, 1986). All things considered, mishaps could be averted. The dangerous demonstration is an infringement of an acknowledged safe methodology which could allow the event of a mishap.

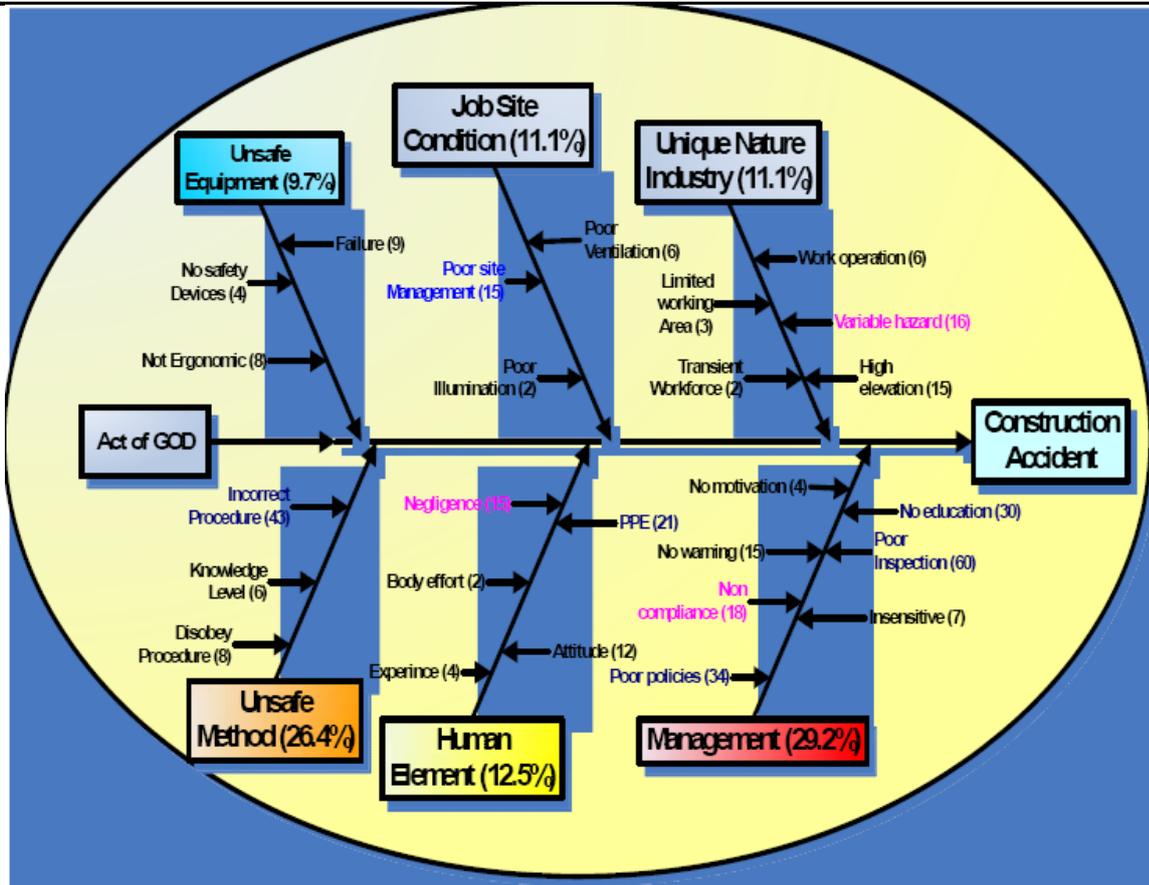


Fig.1: Causes of Construction Accidents from 128 DOSH reports in year 2000 to 2004

#### IV. DISASTERS PREVENTION

##### 1. Importance of development and ramifications of fiascos -

Development speaks to the vast majority of each country's reserve funds. Ponders demonstrate that Gross Domestic Fixed Capital Formation in development is 45-60 percent of the aggregate capital arrangement (Ofori, 1990; Hillebrandt, 2000). Badiane (2001) gauges that interests in lodging alone constitute in the vicinity of 2 and 8 percent of GNP; in the vicinity of 10 and 30 percent of gross capital development; in the vicinity of 20 and 50 percent of collected riches; and in the vicinity of 10 and 40 for each penny of family consumption. Developed things are key to the quest for monetary movement as they give the space expected to the creation of all products and ventures.

The physical framework worked through development movement at awesome cost is the country's monetary spine as it constitutes the courses for the help of beneficial action by empowering products and ventures to be appropriated. The things assembled likewise offer social and welfare benefits. For instance, lodging satisfies a standout amongst the most fundamental needs of individuals by giving asylum from the components. Assembled things likewise offer individuals the chance to enhance their expectations for everyday comforts.

Consequently, a catastrophe which prompts to critical harm to the manufactured stock, the same number of them have a tendency to do, can have adverse results for the economy and for the prosperity of the general population, regularly for drawn out stretches of time.

##### 2. Developing Countries-

Debacles greaterly affect the fabricated environment of creating nations than industrialized ones. The World Bank appraises that misfortunes because of regular debacles are 20 times more prominent (as a rate of GDP) in creating nations than in the industrialized countries. The harm to the monetary and social 4 framework for the most part sets aside a long opportunity to reproduce after a catastrophe, bringing about additional anguish to the people.

### 3. Unusual Occurrences of Hazards amid Construction Phase of Monorail-

The most widely recognized dangers in the development periods of Monorail are amid:

#### **Lifting and pushing - e.g. dealing with overwhelming or cumbersome measured items.**

Lifting operations are inborn to numerous occupations in the development business. They can be performed physically or utilizing lifting hardware. Both manual lifting and mechanical lifting operations can put development specialists at extraordinary risk of harm or wellbeing side effects bringing about wiped out leave or inability. The expenses of mischances and sick wellbeing identified with lifting operations are monstrous. This depicts the risks related with lifting operations in the development business and measures to decrease these risks.

### 4. Some Recent Examples of Disasters and their Impact on Constructed Items

There are numerous current cases of unintentional debacles which have had major physical outcomes.

In July 2009, in the most exceedingly bad mishap ever, five individuals were slaughtered and 15 harmed when a lifted area of the tracks under development came smashing down. The solid chunks that broken down were a piece of a lifted segment of another Metro course between the Central Secretariat and Badarpur area. The mishap occurred around 5 a.m. at the development site at Zamrudpur close Kailash Colony in south Delhi. A propelling brace alongside a segment of the raised tracks set up on pre-manufactured columns broken down with an ear-part commotion.



Fig.2 Elevated section of the tracks under construction came crashing down in Delhi Metro

In **March 2010**, two people were injured when a crane toppled at a Delhi Metro construction site in southeast Delhi. The incident took place between the Mohan Estate and the Tughlakabad Metro stations. The crane was within the barricaded area and was lifting iron rods at the site when it toppled. Its boom hit an auto rickshaw parked outside the barricaded area. A hydra crane toppled and fell on one of the auto-rickshaws parked nearby. Two people, an employee of a sub-contractor and an auto rickshaw driver, suffered minor injuries.



**Fig. 3 Crane topples at Delhi Metro site; two hurt**

In **July 2011**, two persons died and three were injured when a beam weighing 60 tonnes collapsed on them at the construction site of the Mumbai monorail project on RCF Road in Chembur. The RCF police registered a case of accidental death. Police had conducted an investigation and registered a case of negligence. However, MMRDA officials, who were present at the site, requested anonymity said no proper safety measures were in place.

In **July 2013**, a concrete monorail beam collapsed on a crane that was being used to launch it between two pillars at Bhoiwada Naka in Parel. There were no injuries reported, but the crane and the beam was damaged. MMRDA took action based on a preliminary report submitted by contractors L&T, Scomi Engineering and consultant Louis Berger. As per the report, the beam was being launched using two cranes — a Hydraulic Crane and a Lattice Boom. As it was being lifted, the wire rope of the hydraulic crane got entangled with the metallic structure on the pier. The crane operator continued to lift the beam by winding the rope. The rope snapped and one end of the beam rested on the body of the hydraulic crane, while the other end of the beam was held by the lattice boom crane. Due to heavy rains, the supervisor and the signalman failed to notice the wire rope entangled with the metallic structure, the report added. Traffic was diverted and the road was reopened for motorists around noon after the beam was removed.



**Fig. 4 Concrete beam collapses at monorail site in Parel**

In **June 2014**, Brazilian worker killed in accident at Sao Paulo monorail project. In Sao Paulo, an accident at a construction project to build a monorail in Brazil's largest city has killed a worker. Authorities said one man was killed and another injured yesterday when a large concrete support beam fell from an under-construction section of the 17.7km monorail track.



**Fig. 5** A rafter is seen on the ground at a construction site for the monorail where one construction worker died and two workers were left injured after one of the rafters collapsed in Sao Paul

## 5. Maintenance and review

Mischances may happen on the grounds that lifting hardware is not examined and looked after routinely. All hardware ought to be completely inspected before it being put into administration and after there has been any real change that could influence its operation. Lifting gear may should be altogether inspected at interims set down in an examination plot drawn up by an able individual, considering the maker's suggestions.

## 6. Reports and deserts

Records ought to be kept of every single careful examination and reviews, and of the EC Declarations of Conformity for all lifting gear and lifting adornments. Any deformities saw ought to be quickly answered to the manager for redress. In the event that any imperfection influences the protected operation of the machine, it ought to be amended before the machine is utilized.

## V. EXPECTED RESULTS

1. To specify the role of systems, policies and procedures that in preventing disasters in order to ensure that risks remain low as reasonably practicable.
2. How disasters and their effects on construction phase of the Monorail can be addressed, including their prevention and reconstruction after their occurrence.
3. The role of the construction industry development in disaster management.
4. To ensure all possible assistance is provided to the fire services, police, medical and other paramedical personnel in reaching the affected area and carrying out their functions of rescue and relief.
5. To Ensure that all officials who are responsible to deal with the emergency situation are thoroughly conversant with their duties and responsibilities in advance.
6. To specify some recommendations for further appropriate action.

## VI. CONCLUSION

After the detail inquires about papers the conclusion has been drawn.

1. Detail comprehension of the catastrophe, calamity management process and structures influenced by fiasco.
2. The elements in charge of the calamity of the structure and the death toll and property.
3. Comparative consequences of different later and past calamities help in the vital strides later on.
4. Significant relationship between components of the catastrophe management system and calamity risk reduction program.
5. Necessity of Implementation of calamity management approach at different levels to accomplish needs specifically with the advancement of more secure and more secure development.

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