

Risk and Disaster Management in Construction

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Question 1.

Considering the Bus Rapid Transit (BRT) Peshawar, what were the risks involved during construction associated with the technical aspects of the project?

Support your answer with logical and factual arguments along with references.

State how we could counter the risks associated with the technical aspects.

RISK:

- The concept of risk can be linked to uncertainties associated with events. Within the context of projects, risk is commonly associated with an uncertain event or condition that, if it occurs, has a positive or a negative effect on the objectives of a project.
- Risk originates from the Latin term *risicum*, which means the challenge presented by a barrier reef to a sailor.

Around the world, governments at all levels take part very important roles in organizing the safety and comfort of public transportation systems in the form of BRTs. Huge Construction projects such as BRT are initiated in intricate and dynamic conditions bringing about conditions of high vulnerability and risk, which are compounded by challenging phase restrictions. Constructions of BRT's have reformed suggestively from the past numerous years. It is a structure obsessed primarily by govt. Sponsors. It is exposed against the several specific and trade risks that habitually speak to more remarkable publicities than those that are conventional. In this manner risk assessment requires develops. Risk taxation is an apparatus to classify those hazards in a task and direct it as requirements be with suitable management.

For every project especially Mega projects feasibility study, proper planning, designing, Risk management & its proper implementation is required. There are certain essential requirements for Mega Project must be consider as Huge Money of Govt or Public Private is involved among which one Risks management.

Risk during construction Associated with the technical Aspect of the project are following

- 1) Extended Duration of construction
- 2) Technical complexity and innovation in Design requiring new Methods of construction.
- 3) Removal of support
- 4) Dangerous substances and items during construction.

- 5) Defective design
- 6) Defective material and workmanship
- 7) Mechanical and electrical breakdown
- 8) Inadequate site management
- 9) Ground movement
- 10) Subsidence
- 11) Explosion and fire
- 12) Vibration and oscillation
- 13) Defective temporary works
- 14) Corrosion
- 15) Collapse

Some of the highlighted risk in technical aspects are given bellow.

Extended duration of construction :

In most of the projects it shown that greater chances of hazard can occur as the time for the project increases because the project is exposed to the environment for risk occurrence. Where BRT extended from six months to two and a half years. Moreover, there are seasonal risks in certain conditions that arise at different times of the year, and thus need extra consideration if the construction duration is to be extended. Such threats include drought, fluctuations in temperature, flooding, storms and winds.

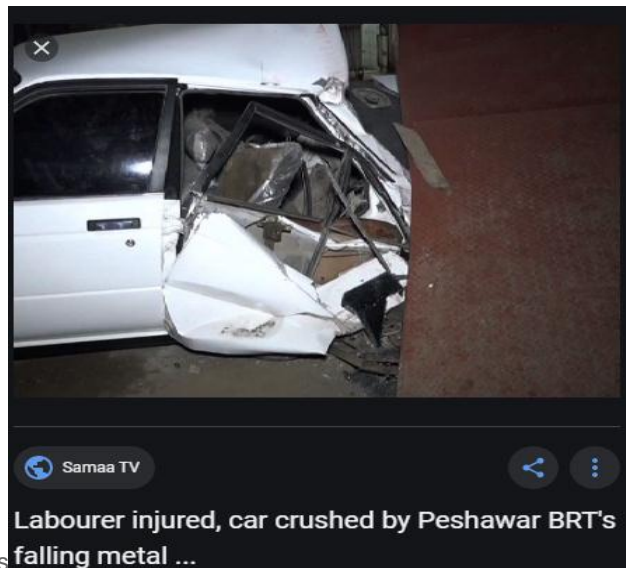
To illustrate this point, the example of BRT Peshawar can be cited. it is a project in very congested area that is exposed to all types of accidents such as vehicle accidents, traffic jam machinery crash, girder fall and heavy rain. Due to BRT Peshawar, traffic every time jams occur in just a few places, vehicle accidents and also due to time extension, budget increase from Rs49 billion to Rs68bn.

. [The K-P government started the project in October last Year with the former chief minister Pervez Khattak claiming that the project would be completed within six months. The first deadline set for the completion was April 20 which was extended to May 20. The then Project Director BRT and Director General of Peshawar Development Authority Israrul Haq then told media that the project's civil work would be completed by June 20 which too has been unachievable

.reference: Peshawar BRT launch further delayed till end of the year



June 29, 2018



Labourer injured, car crushed by Peshawar BRT's falling metal ...

hed:

Technical complexity and innovation in Design requiring new Methods of construction:

When local materials or methods are used in construction, the familiarity of those involved with the design or the work itself may allow an occasional uncertainty in the drawings or specifications without them being misinterpreted. It may even provide correction of a mistake. However, in a new or relatively new design, material or construction method, what is needed is precise and thorough communication between the designer, manufacturer or contractor, as the case may be, and others involved in the construction process.

BRT Peshawar is mega and new project for Peshawar area which is in developing phase. Whereas the designer were also foreigner which were not familiar with such a project for backward area. This was the first mega project for kpk. In BRT Peshawar latest machines technology for this mega project were used like augor boring machine, mixture machine, and rigid paving machine and so on.

Defective design:

In project planning stage of BRT a lot of items are missed such as drainage routs, gas pipe line and crossways are not included in designing therefor during project execution stage engineers as well as executer face a lot of problem. After completion of major part of BRT, when buses was brought from china and start testing on road, the given design was defective. According to following paragraph. The ADB has warned in clear words that BRT buses could collide at stations

It is disappointing that the directional arrows are entirely missing from the implementation. As a remedy, it will not be acceptable to merely place taped arrows on the surface. ADB read

In yet another glaring deviation the curb interface between the vehicle and the platform does not meet the Kassel curb design mandated in the detailed design of the project.

The lack of an effective curb means that the docking process will be slow, inefficient and potentially damaging to the vehicle tires. Lander observed

The width of the lane against the requirement of at least 6.5 meters is generally below the minimum threshold at many stations. ADB noted

Causes concern over the safety and efficiency of the operations. There is significant concern of corridor lane widths at turn near BS10, BS12, BS15, and BS26. Over the course of operations, the current design may well result in collisions between BRT vehicles. ADB reported.

Reference: ADB found deadly flaws in Peshawar BRT.

Dangerous substances and items during construction and/or commissioning:

- It is stated that poor substances low quality material is used during construction of BRT Peshawar.
- Such as corroded steal used and concrete which initial setting time over run, due to these dangerous substances the time as well as authenticity become lower.
- According to following statement: the ADB stopped the provincial government from making future payments to contractors because of the poor quality of work.
- The ADB loan will not be disbursed further until the provincial government introduces changes in the design to address “critical” deficiencies.

The inferior quality construction could damage the project’s reputation at the international level, warned the lender that had approved a \$335 million (Rs53 billion) loan for the project in mid-2017.reference:[**Inferior quality material used in Peshawar BRT project: ADB**

Defective material and workmanship:

The warranty of incorporating or using only good workmanship and material is implied in construction contracts. Despite that warranty, one finds that as long as quality means perpetual care and high cost, this risk of defective workmanship and material will always exist. Even the smallest defect can sometimes cause a disastrous effect, as happened in the case described below.

- The stair step height varies “considerably”, which presents a safety problem. “The mild steel flooring material utilized for the ramps and stairs is of an unacceptable quality,” the ADB noted.
- At many places, pillars or stairways “do not align properly”. At certain stations, the stairs and escalators have been built in the middle of the stations, obstructing walking space. “The footpaths are blocked by the placement of the public toilets and stairways,” according to the correspondence. Reference: ADB found deadly flaws in BRT Peshawar

Defective design, workmanship and quality control :

The critical deficiencies would result in improper docking of buses at the stations and could cause injuries to passengers as well. The tiles are slippery and directional arrow tiles are missing as well

- The ADB noted that there were “significant design deviations from the agreed detailed design that impede or degrade system performance.
- The provincial authorities also used “inferior material” that both harm system functionality as well as deliver an aesthetically inferior product, according to the correspondence.
- The lender’s third major objection relates to the lack of adequate construction supervision and communication. The ADB seeking modifications to remove the defects might not slow down the completion of the already much delayed project but also further surge its cost . reference : ADB reported deadly flaws in Peshawar BRT.

Inadequate site management:

The inadequacy of site management not only delay the project but also sometime causes the main failure of whole project. See the following paragraph about BRT Peshawar

- Considering his position at the BRT as an assistant engineer, Gohar went on to say, "The contractor has not yet submitted any schedule for the completion of BRT project nor progress report has been submitted to any concerned department.
- "The contractor of the project has given the entire project to different non-technical people who don't even know about construction."
- He further claimed that the site inspector did not have any "drawings and specifications of the project" with him to help guide the engineers.
- "The engineers were found just to visit the site without any drawing and specifications.

“Reference [Peshawar BRT management dismisses corruption allegations as 'baseless']

Corrosion:

The corrosion seems to be an all-pervasive phenomenon causing widespread destruction of all types of structures in all countries across the world and has come to be termed as ‘Cancer’ for concrete. The ticketing kiosks are also of inferior quality where corrugated steel has been used. “This is not acceptable for the effort and investment made into the Peshawar system; this will generate a very negative view of the system both [on a] national [level] and internationally,” the lender warned.

Conclusion and Recommendations:

To conclude, this paper has contributed to the construction industry of Pakistan as it has exposed and identified the risks involved in mega projects. Moreover, it has highlighted the adopted risk management practices and resource allocation methods implemented by different stakeholders of the construction industry of Pakistan. Stakeholders like Project manager, Planner, supervisor and key stakeholders will be able to get information regarding different aspects of risk management associated to different construction activities. The paper has revealed that risk management system is less problematic instead of its implementation as per interviewer's exposures. Few managers faced resistance to change as maintaining previous practices when tried to develop and implement the risk management system in their current organizations. Due to existing practice it was difficult to change the practices so early because of taking long time to change the culture adoptability. Therefore for developing and implementing it is essential to educate all stakeholders. It is concluded that important project related risk on bases of priority are Error in design, Design Complexity, Prices Fluctuations, Tax rate, Poor Coordination, Pre-qualification and reputation of contractor, Key stakeholder relationships, Side condition unforeseen and finally delay or change in drawings supply.

QUESTION 2:

Question 2. You are going to initiate a construction project. During the project, annual probability of occurrence of a hazardous event is (ID/6585200). If the event occurs, then the cost of the loss will be 45,275,000 US\$ (consequence). By referring to Table 2.1 & Table 2.2, identify the risk level in the risk matrix shown in Figure 2.1.

TABLE 2.1

Category	Description	Annual Probability Range
A	Likely	≥ 0.1 (1 in 10)
B	Unlikely	≥ 0.01 (1 in 100) but < 0.1
C	Very unlikely	≥ 0.001 (1 in 1,000) but < 0.01
D	Doubtful	≥ 0.0001 (1 in 10,000) but < 0.001
E	Highly unlikely	≥ 0.00001 (1 in 100,000) but < 0.0001
F	Extremely unlikely	< 0.00001 (1 in 100,000)

TABLE 2.2

Category	Description	Cost (US\$)
I	Catastrophic loss	$\geq 10,000,000,000$
II	Major loss	$\geq 1,000,000,000$ but $< 10,000,000,000$
III	Serious loss	$\geq 100,000,000$ but $< 1,000,000,000$
IV	Significant loss	$\geq 10,000,000$ but $< 100,000,000$
V	Minor loss	$\geq 1,000,000$ but $< 10,000,000$
VI	Insignificant loss	$< 1,000,000$

FIGURE 2.1

Probability category	A	L	M	M	H	H	H
	B	L	L	M	M	H	H
	C	L	L	L	M	M	H
	D	L	L	L	L	M	M
	E	L	L	L	L	L	M
	F	L	L	L	L	L	L
		VI	V	IV	III	II	I
Consequence category							

GIVEN DATA:

Annual probability of occurrence of hazardous event is (ID/6585200)

My ID CARD NO=15575

Name: Irfan ullah

If event occur, the cost of the loss will be “45275000US\$”

By using Table 2.1, Table 2.2 and Figure 2.1

Requirement:

Find out the Risk level in FIG 2.1

Solution:**Step 1:**

First find annual probability value from (ID/6585200)

ID = 15575 By putting value we get

Annual probability value=15575/6585200

=0.00236 or

= 1/442.81

To select likelihood category for RISK matrix from table 2.1

Likelihood Categories for a Risk Matrix

Category	Description	Annual Probability Range
A	Likely	≥0.1 (1 in 10)
B	Unlikely	≥0.01 (1 in 100) but <0.1
C	Very unlikely	≥0.001 (1 in 1,000) but <0.01
D	Doubtful	≥0.0001 (1 in 10,000) but <0.001
E	Highly unlikely	≥0.00001 (1 in 100,000) but <0.0001
F	Extremely unlikely	<0.00001 (1 in 100,000)

.00236 > 0.001 but < 0.01

In table 2.1It show category "C"

Step 2:

Now to select consequence category for Riak Matrix in monetary Amounts US\$. We will move toward table 2.2

Example Consequence Categories for a Risk Matrix in Monetary Amounts (US\$)

Category	Description	Cost (US\$)
I	Catastrophic loss	≥10,000,000,000
II	Major loss	≥1,000,000,000 but <10,000,000,000
III	Serious loss	≥100,000,000 but <1,000,000,000
IV	Significant loss	≥10,000,000 but <100,000,000
V	Minor loss	≥1,000,000 but <10,000,000
VI	Insignificant loss	<1,000,000

45275000US\$ >10000000 but < 100000000

So from given table 2.2 it show "catagary IV" "significant loss" will occur

Step 3:

So To find out the risk level we will move toward Figure 2.1

Put the value in Figure 2.1

Probability category	A	L	M	M	H	H	H
	B	L	L	M	H	H	
	C	L	L	L	M	M	H
	D	L	L	L	L	M	M
	E	L	L	L	L	L	M
	F	L	L	L	L	L	L
		VI	V	IV	III	II	I
Consequence category							

Conclusion:

From above value in the cell of figure 2.1 this show that the **risk is of low level** and it can be neglected because the probability of occurrence is very unlikely. So it mean it is acceptable and negligible.