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Ire National University

Mid Term Exam Paper

Subject: Risk and Disaster Management in Construction

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Q1:

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

WHAT IS 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.
- ❖ Oxford Dictionary defines risk as the chance of hazard, bad consequence, loss, and so on, or risk can be defined as the chance of a negative outcome.

Introduction:

Millions of cities currently in the world are facing with serious problem of overcrowding and contamination; they are continuously searching for cost effective, efficient and reasonable source for public transports improvements. It is evident that a well-organized and cost effective/saving public transport system is vital for daily nonstop journey of peoples within big cities. Public transport is now dream for the peoples, proper Government transport system is not available in Pakistan and all the system has gone into the hand of private sector transportation whose management is flop and not coordinating with public demand. BRT system is now getting worldwide recognition as a unique system which provide best and optimal solutions for giving high standard mobility services with reasonable /affordable prices to the urban peoples in developed and as well as under developed countries in the world. BRT provides high-quality services with reasonable price customer care transportation that is responsible for providing standard and unique services to the urban peoples [III]. The purpose of BRT is to reduce traffic congestion; it is built on corridors - a separate and safe way. Future planner prefers those places for BRT where they expect more traffic congestion in future [V]. BRT contains similar features like a light rail or metro system, due to its virtue it is consider much more consistent, suitable and faster than any customary transport service. Due to its tremendous features, BRT is capable to control the causes of delay and other related issues such as being stuck in rush hour gridlock and lining to pay on board. BRT camber defined as inelastic, rubber

tired, rapid transit means that combines locations, automobiles, facilities and ITS origins into a unified arrangement with solid progressive identity that summons an extraordinary picture. The concept of (BRT) is basically based on public transport system within a specific city, planned to improve mobility/ journey capacity and consistency with the view to improve the deficiencies of a conventional or traditional transportation system.

Peshawar BRT:

The first BRT (Trans Peshawar) system of KPK- Khyber Pakhtunkhwa which is right now under building by the supervision of PDA (Peshawar Development Authority) in the main city of Peshawar, a capital of province KPK - Pakistan. The project has divided into two distinct phases, in the main phase of the BRT system east -west corridor will be focused where 31 stations will be constructed with an initial deployment of 383 buses; Asian Development Bank has initially provided 88% of funding. It is worth mentioning that the Government of Khyber Pakhtunkhwa in 2013 submitted a request for maintenance from the Cities Development Initiative for Asia (CDIA) to develop Peshawar's urban transportation network which is badly disordered and mismanaged in all the way. CDIA entertained this request and quickly finished the Town Transport Prefeasibility Study that planned a 20-year city transport strategy, with a 10-year act plan. The CDIA thoroughly considered the aspect two passageways, a north-south passageway and an east -west passageway, and finalized his recommendations that the east-west passageway should be constructed first .Construction started under the supervision of PDA on 29 October 2017 [XIV].

Risks involve during construction associated with the technical aspects of the project:

According to the above difinations we difne that risk is uncertain events or conditions so technical means involving the sorts of machines, processes, and materials that are used in industry, transport and comunnications.

Extended duration of construction:

In most of the projects it seen that when the duration increase for project, greater chances of hazard can occure because project exposed to Environment for risk occurance.where BRT extedent from 6 month to 2.8 years.

However, in certain circumstances, there are seasonal hazards which occur at specific times of the year and thus require special consideration if the period of construction is to be extended. These hazards include rainfall, temperature changes, flood, storm and wind. To illustrate this point, the example of BRT Peshawar may be cited. It is a project in a very congested area which is exposed to every type of accident such as vehicle accident, traffic jam, machinery fail, guard rail fall and heavy rain. Due to BRT Peshawar, traffic every time jam in few areas, vehicular accidents occur and also due to time extension budget increase from 10 billion to 90 billion because of devaluation of Pakistani rupees.

Now the contractors attempted to rectify the levels, but in doing so he spent more time

❖ ***Technical complexity and innovation in design requiring new methods of construction and/or erection***

When traditional materials or methods are used in construction, the familiarity of those involved with the design or the work itself may permit an occasional ambiguity in the drawings or specifications without them being misinterpreted. It may even provide correction of a mistake. However, in a 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. Examples BRT Peshawar is a new project and all technology new for a developing area such as KP where the designer was also a foreigner which was not familiar as required for such backward area project. Where BRT was designed as for London BRT design.

❖ ***Dangerous substances and items during construction and/or commissioning***

The following example from BRT highlights the effect of such substances on construction work. Shortly after commencement, the boring process was carried out in reach III when boring machine driver touched the electricity wire, where the whole machine became short and the driver died on time, another dangerous event that was very common in every place of the BRT site, that was sanitary pipe/channel which there was no design present in BRT for it and when drainage came in cross, after the event occurrence design was changed again and again for it.

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. Reference:

[Asian Development Bank finds 'deadly flaws' in Peshawar BRT project]

Defective design:

After completion of major part of BRT, when buses were brought from China and started testing on road the given design was defective and not suitable to given design of bus so major portion of BRT was redesigned for buses and due to this defective design some part of BRT demolished for redesign and thus the whole project late. The project manager was responsible for it because the

design of road was just design for buses which its length and width was change then those which PM given design to BUS company and also the design of BRT changed several time because of defective designer.

The ADB has warned in clear words that BRT buses could collide at stations number 10, 12, 15 and 26 during operations because the lane width is less than the minimum requirement of 6.5 metres.

“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,” the ADB correspondence 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 tyres,” the lender observed . The width of the lane, against the requirement of a at least 6.5 metres, is generally below the minimum threshold at many stations, which the ADB noted “causes concern over the safety and efficiency of the operations” .

“There is significant concern of corridor lane widths at turns near BS10, BS12, BS15 and BS26. Over the course of operations, the current design may well result in collisions between BRT vehicles,” according to the ADB

correspondence reference: [AsianDevelopment Bank finds 'deadly flaws' in Peshawar BRT project]

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 according to following statement:

The ADB stopped the provincial government from making future payments to the 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 workmanship and material:

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 utilised 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 finds 'deadly flaws' in Peshawar BRT project**]

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 only slow down the completion of the already much-delayed project, but also further surge its cost.

Reference: [**ADB finds 'deadly flaws' in Peshawar BRT project**]

Mechanical and electrical breakdown Inadequate site management:

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 [sublet] 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.

Reference: [AsianDevelopment Bank finds 'deadly flaws' in Peshawar BRT project]

Q2:

Given data:

Annual probability of occurrence of a hazardous event = (ID/6585200)

=15524/6585200=0.00235

Cost of loose (Consequence) = 45,275,000 US\$

Required:

Identification of the risk level in the risk matrix.

Solution:

For finding of risk in table of risk matrix first we identify probability in table 2.2 and consequence in table 2.4.

Table 2.2 Likelihood categories for 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)

Our probability price is 0.00235 as per above table it's in **category C** and likelihood description is **very unlikely**.

Table 2.4 Example Consequence Categories for a Risk Matrix in Monetary Amounts (US\$).
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

The cost of loose or consequences cost is 45,275,000 US\$ so it's in category IV consequence description is Significant loss.

According to given data the Risk Matrix found to be "LOW".

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						

Result: As per comparing of Probability category and Consequence category the

Risk level is Low (L) so it can be treated as acceptable without review

