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**SUBJECT: RISK AND DISASTER  
MANAGEMENT**

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APRIL 24, 2020  
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LECTURES IN IQRA UNIVERSITY PESHAWER

**Question 1. 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.*

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

*Risk associated with technical aspect of project is sort of machines, processes, and materials risk in industry, transport, Communication Company.*

*Some of majors risk with technical aspects are given bellow.*

#### **Extended duration of construction**

*In most of the projects it seen that when the duration increase for project, greater chances of hazard can occur because project exposed to environment for risk occurrence. Where BRT extend 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 very congested area which is exposed to every type of accident such as vehicle accident, traffic jam machinery fail, girder fall and heavy rain, due to BRT Peshawar, traffic every time jam on road, vehicle accidents occur and also due to time extension, budget increase from Rs49 billion to Rs68 billion. [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*

By [Sohail Khattak](#)

Published: June 29, 2018

*[The cost of the Peshawar Bus Rapid Transit project has gone up from Rs49 billion to over Rs68 billion due to the changes to its design and 'adjustment' of the Asian Development Bank funds, the provincial cabinet's last meeting was informed on Thursday].REFERENCE:*

**[BRT cost goes up to Rs68bn](#)**  
**[Bureau Report](#)** May 25, 2018



Figure 2: traffic jam due to BRT



Figure 1: several accident occur due to BRT Peshawar

## ***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 design in first time.so the project design as well as technology were new for engineers as well as for implies.*

brt peshawar warking and machines latest technology the brt is one of the mega project in peshawar in this project is showing you latest technlonlogy is useded like mixture machine and concrete machine and so on.reference:[ [brt peshawar warking and machines latest technology](#)]



### *Defective design*

*In project planning stage 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. Where in BRT the design was defective as much that in design it was not clearly show where is drainage pipe or where is gas pipe and After completion of major part of BRT, when buses was brought from company and start testing on road, the given design was defective and not suitable to given design. According to following paragraph.*

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

By **Shahbaz Rana**

Published: July 7, 2019



**Figure 3: gas pipe in BRT underground rout and drainage supply disturb due to defective design**

### ***Dangerous substances and items during construction and/or commissioning:***

*It is stated that poor substances/low quality material are used in 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 aesthetic become lower. According to following statement:*

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

The provincial authorities also used “inferior material” that both harm system functionality as well as deliver an aesthetically inferior product, according to the correspondence [Peshawar BRT project: ADB] | Asia Last Updated at July 7, 2019 19:40 IST



Figure 4: pictures show the corroded steel used in girders and other impure material

### *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, in “BRT” source say that defective workmanship and materials used which can be denounce and become the cause failure in future for BRT. According to source:*

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

By **Shahbaz Rana**

Published: July 7, 2019

### *Defective design, workmanship and quality control*

*Defective design, workmanship and quality control are the major points for failure of a project, where in “BRT”, according to sources all these point meet.*

*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**]

By **Shahbaz Rana**

Published: July 7, 2019



Fig 4: show the defective design of BRT

### ***Inadequate site management***

*The inadequacy of site management not only delay the project but also sometime cause the main failure of whole project. According to source there were no such management on sit as required for such a bilinear 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 [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'**]


PUBLISHED IN Thursday May 31 2018  GEO NEWS



Fig 5: these pictures show clearly the miss management of" BRT"

## 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. Where in "BRT" such mega project corroded steal used which is a huge risk for "BRT" project. According to source:*

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**

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Fig 6: these picture are taken from sit of BRT project which show the corroded steal used in Project



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

*Risk Treatment and Control Adding risk treatment and control to risk assessment defines risk management. Risk management involves the coordinated activities to direct and control an organization with regard to risk. For example, risk management is a process by which system operators, managers, and owners make safety decisions and regulatory changes, and choose different system configurations based on the data generated in the risk assessment. Risk management involves using information from the previously described risk assessment stage to make educated decisions about system safety. Risk treatments and control include risk prevention, avoidance, transfer, countermeasures, consequence mitigation, and so on*

***1. Mitigating Risk***

- a) Reducing the likelihood an adverse event will occur.*
- b) Reducing impact of adverse event.*

*After analyzing the risk, plan for it, in such a way to minimize its effect on project.*

***2. Avoiding Risk***

- a) Changing the project plan to eliminate the risk or condition.*

*In this process the PM after analyzing the risk, if possible, change the project plan, to avoid from risk.*

***3. Transferring Risk***

- a) Paying a premium to pass the risk to another party.*
- b) Requiring Build-Own-Operate-Transfer (BOOT) provisions.*

*If a PM analyze that their party is not able to control the technical risk. Then, the company must involve other party to manage it.*

***4. Retaining Risk***

*Risk acceptance is considered a complex subject. The setting of an acceptable level of risk is important to define the risk performance that a system must achieve to be considered safe. If a system has a risk value above the risk*

acceptance level. To determine an acceptable risk, managers need to analyze the alternatives for the optimal choice. In some industries, an acceptable risk has been defined by consensus, so making a conscious decision to accept the risk.

**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. Hint: You can take help from Lecture and book “Risk Analysis in Engineering and Economics” by Bilal M. Ayyub.

Table 2.1  
Likelihood Categories for a Risk Matrix

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

Table 2.2  
Example Consequence Categories for a Risk Matrix in Monetary Amounts (US\$)

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	$< 1,000,000$

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							

Figure 2.1 Risk Matrix (L: Low, M: Medium, H: High)

Given data:

Annual probability of occurrence of hazardous event is (ID/6585200), where “ID”

Show ID card no, my ID CARD

NO=14870

NAME Khalid Rashid

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

NOTE: {by referring table 2.1 and 2.2}

**Requirment:**

Identify the risk level in risk matrix in fiq:2.1

Solution :

**Step no 1:**

First to find out the annual probability from above mention statement.

Annual probability value= $ID/6585200$ -----1

Where ID=14870

Putting the value in equation no 1

Annual probability value= $14870/6585200$

=.00225 or 1/442.85

**Step no#2**

To select likelihood category for RISK matrix from table 2.1

Putting the value in table 2.1

Table 2.1

Likelihood Categories for a Risk Matrix

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

.0022 > .001 but < .01

So from table 2.1

It show category “C”

### Step no#3

To select the consequence category in table 2.2 for a risk matrix in monetary amount.

Putting the value in table 2.2

Table 2.2

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

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	$< 1,000,000$

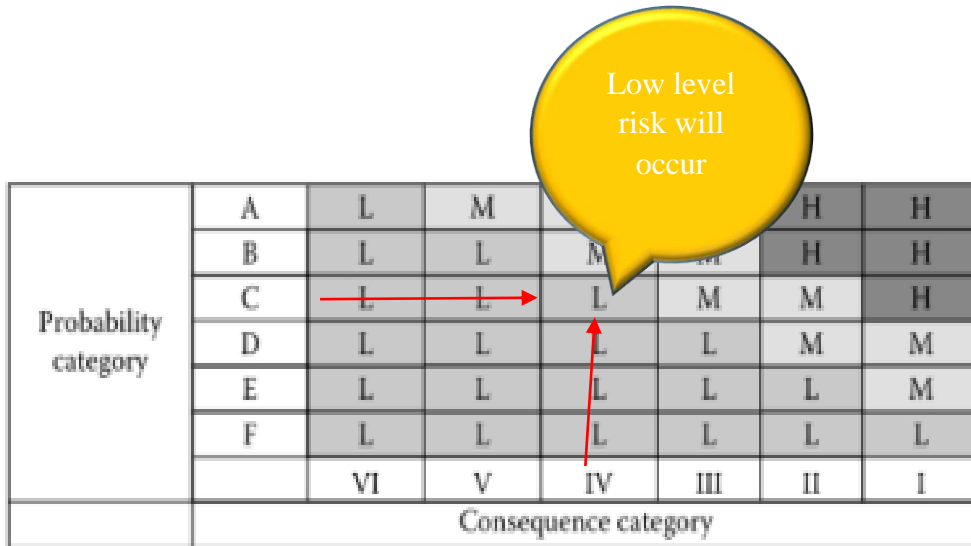
45275000 > 10,000,000 but < 100,000,000

So from given table it show “category “IV” “significant loss” will occur

### Step no#4

To find out the risk level in the risk matrix fig.2.1

Put the value in Figure 2.1



Probability category	A	L	M	M	M	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							

Figure 2.1 Risk Matrix (L: Low, M: Medium, H: High)

**Conclusion:**

*From above value, the risk is low level.*

*With best*  
*regards*