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SUBJECT: Risk and Disaster Management in Construction

Answer 1):

Risk Log/ Register:

A Risk Register, also referred to as a Risk Log, is a master document which is created during the early stages of your project. The Risk Register is a document that contains information about identified project risks, analysis of risk severity and evaluations of the possible solutions to be applied.

Risk Register is a document that contains the information about identified risks, results of Risk Analysis (impact, probability, effects), as well as Risk Response Plans. You also use the Risk Register to monitor and control risks during the whole project life cycle.

There are several advantages and benefits that management members can gain from having a project risk register tool. To make them easier to remember, they're called the seven C's: consistency, compactness, concision, commitment, completeness, control and communication.

Reviews of risk registers can also help to

- identify potential behavioral trends or environmental issues,
- identify and capture risks that may be subject to legislation or business changes,
- Demonstrate to others (regulators, investors, company stakeholders and others) that risks are being managed.
- design controls or mitigation measures to reduce or remove the risk(s) before they occur,
- document better safe work procedures
- Achieve safety objectives, and drive continual improvements.

A typical risk register contains:

- A risk category to group similar risks
- The risk breakdown structure identification number
- A brief description or name of the risk to make the risk easy to discuss
- The impact (or consequence) if event actually occurs rated on an integer scale

- The probability or likelihood of its occurrence rated on an integer scale
- The Risk Score (or Risk Rating) is the multiplication of Probability and Impact and is often used to rank the risks.
- Common mitigation steps (e.g. within IT projects) are Identify, Analyze, Plan Response, Monitor and Control.
- Contingent response - the actions to be taken should the risk event actually occur.
- Contingency - the budget allocated to the contingent response
- Trigger - an event that itself results in the risk event occurring (for example the risk event might be "flooding" and "heavy rainfall" the trig.

Note: Below Risk log show Risk Associated with Installation and Rehabilitation of Solar Pumps or Solar System. The here can be delayed from 1 month up to 4 months maximum because of its nature. This type of Projects has 5% civil works and remaining is installation of equipment's.

ID	Date raised	Risk description	Risk			Without controls			Controls	Residual risk	Action
			H	M	L	Cost impact	Time impact	Other			
1.	05/01/2019	Delaying of project due to stuck of goods at dock		✓		1,00,000/-	10 days	Bad image of company in Private and Government Department	Set a meeting with Import and Export Agent	Cancellation of Work Order	Pre Order of Goods
2	05/05/2019	Damaging of Solar Panels from transporting.			✓	20,000	20 days	Bad image of company in Private and Government Department	Apply extra safety measurement in Truck before loading	Cost Over run	Assuring the Dept for safety transport
3	05/25/2019	Delaying of Reaching Goods on Site due to Security Check post in FATA		✓		50,0000	05 days	Bad image of company in Private and Government Department	Issue the letter to concern authority about informing the staff that will work on site	Cost Over run	Make good relation with concern dept
4	06/02/2019	Lack of Man Labor	✓			30,000	10 days	Bad image of company in Private and Government Department	Bring labor to the site from Main office	Site management Problem	Monitor site from external source

#	Date	Risk				Cost	Duration	Impact	Mitigation		
5	06/15/2019	Land Sliding			✓	5,00,000	5 days	Bad image of company in Private and Government Department	Contact with concern department about weather advisory	Cost Over run	
6	06/20/2019	Road Car Accident			✓	90,000	15 days	Bad image of company in Private and Government Department	Train the driver in school for harsh area		Extra drivers for emergency
7	07/02/2019	Lack Of Hospital near Sites	✓			40,000	10 days	Bad image of company in Private and Government Department	Supply the medical kit to labor before leaving for sites	big injuries	Check health condition of labor before site installation
8	07/21/2019	Working at Height		✓		50,000	8 days	Bad image of company in Private and Government Department	Fall protection and PPE should be provided to the labor working at height	Nil	Get Insurance
9	07/29/2019	lack of sun in rainy days			✓	60,000	25 days	Bad image of company in Private and Government Department	Contact with concern department about weather advisory	Equipment Damaging	Work in sunny days
10	08/20/2019	Damaging of Equipment's during site Installation	✓			60,000	13 days	Bad image of company in Private and Government Department	Additional emergency supplies	Cost Over Run	Disposable emergency equipment
11	08/23/2019	Explosion			✓	80,000	14 days	Bad image of company in Private and Government Department	Strong safety standard	Security Department Dealing	Labor Security Guard

Answer 2):

It is an easy tool to determine which potential decision would make the most financial sense for the business or individual. The process also takes indirect benefits or costs into consideration, like customer satisfaction or even employee morale. And opportunity cost often plays a big role when deciding between several options. When listing potential costs and benefits, companies or analysts will often factor in things like labor costs, social benefits and other factors that may not be immediately obvious. A cost-benefit analysis is a process businesses use to analyze decisions. Before building a new plant or taking on a new project, prudent managers conduct a cost-benefit analysis to evaluate all the potential costs and revenues that a company might generate from the project. The outcome of the analysis will determine whether the project is financially feasible or if the company should pursue another project.

In many models, a cost-benefit analysis will also factor the opportunity cost into the decision-making process. Opportunity costs are alternative benefits that could have been realized when choosing one alternative over another. In other words, the opportunity cost is the forgone or missed opportunity as a result of a choice or decision. Factoring in opportunity costs allows project managers to weigh the benefits from alternative courses of action and not merely the current path or choice being considered in the cost-benefit analysis.

By doing the correct cost benefit analysis, the revenue and sales increases from increased production or new product. Intangible benefits, such as improved employee safety and morale, as well as customer satisfaction due to enhanced product offerings or faster delivery. Competitive advantage or market share gained as a result of the decision.

As a technique, it is used most often at the start of a programmed or project when different options or courses of action are being appraised and compared, as an option for choosing the best approach. It can also be used, however, to evaluate the overall impact of a programmed in quantifiable and monetized terms.

CBA adds up the total costs of a programmed or activity and compares it against its total benefits. The technique assumes that a monetary value can be placed on all the costs and benefits of a programmed, including tangible and intangible returns to other people and organizations in addition to those immediately impacted. As such, a major advantage of cost-benefit analysis lies in forcing people to explicitly and systematically consider the various factors which should influence strategic choice.

Example 1:

Company name Sustainable Energy Associates (pvt) ltd located in Hayatabad is a Renewable energy based company has decided to increase its sales team by adding 2 sales manager. They calculated that by the end of June 2021 (12 months), they should achieved 3 Million (3000000) rupees gain in net profit. On the cost side of the equation, the company must examine the cost of the two sales manager salaries - estimated at 1200000 per year. Additionally, there is the cost of recruitment, which might be around 50000. Training could add an additional 50000.

Now using the benefit cost ratio (BCR)

BCR = 3000000/1300000 = 2.30

Given that the value is positive and greater than 1 (and the total benefits are greater than the total costs), the cost benefit analysis indicates the decision to hire two additional sales manager would be a beneficial move for the company.

Example 2:

Below is 2 fig project cost calculation of Government sector Project (PHED) which has completed by Sustainable Energy Associates (pvt) ltd located in Hayatabad.

The data of Discharge, total head and pump setting is given in Documents as well as project cost. Now they decide on the basis of below 2 table whether to apply for project or not. They have set the cost benefit analysis in table 2 by dividing the Project cost by the total number of PV power. If the value is less than 150 then they will not apply for the said tender because the profit will be less than 10 %.

	S.No	Name Of Work	Discharge IGPH	Total Head(ft)	Motor Efficiency (Minimum Reuired 75%)	Pump efficiency (Minimum Reuired 70%)	WHP (HP)	WHP (KW)	Pump Shaft Power (KW)	Motor BPH (HP)	MOTOR BPH (HP) WITH 10% SAFTEY	Pump setting	Motor Input Power (KW)	Total PV Power (Minimum Required) (KW)
		ADP. 153/160645 (2019-2020)												
1	1	WSS SADEEQ ABAD UC SURIZAI BALA PK-70	5000	300	80.00%	72.50%	7.59	5.66	7.81	10.47	11.64	100	9.77	17.09

	PHED BANNU ULTIMATE ENGINEERING 04-05-2020				
S.No	NAME OF WORK	SUBTRACTING OF SOLAR SYSTEM	TOTAL BID COST	CDR AMOUNT	PER WATT PRICE OF PROJECT (Actuall Watts at Site)
	ADP. 153/160645 (2019-2020)				
1	WSS SADEEQ ABAD UC SURIZAI BALA PK-70	Rs3,300,000	Rs3,500,000	Rs70,000	Rs190

In most construction projects, factors other than money must be taken into account. Cost–benefit analysis provides a logical framework for evaluating alternative factors that may be highly conjectural in nature. If the analysis is confined to purely financial considerations, it fails to recognize the overall social objective, to produce the greatest possible benefit for a given cost. At its heart lies the recognition that a factor should not be ignored because it is difficult or even impossible to quantify it in monetary terms. The essential cost–benefit analysis is to take into account all the factors, which influence either the benefits or the cost of a project. Imagination must be used to assign monetary values to what at first sight might appear to be intangibles. It should be mentioned that monetary values are highly subjective and must be evaluated with care. Even factors to which no monetary value can be assigned must be taken into consideration. The analysis should be applied to projects of roughly similar size and patterns of cash flow. Those with the higher cost–benefit ratios will be preferred. The maximum net benefit ratio is marginally greater than the next most favored project. The scope of the secondary benefits to be taken into account frequently depends on the viewpoint of the analyst. It is obvious that, in comparing

alternatives, each project must be designed within itself at the minimum cost that will allow the fulfilment of objectives including the appropriate quality, level of performance and provision of safety. Perhaps more important, the viewpoint from which each project is assessed plays a critical part in properly assessing both the benefits and cost that should be attributed to a project. For instance, if a private electricity board wishes to develop a hydroelectric power station, it will derive no benefit from the coincidental provision of additional public recreational facilities, which cannot therefore enter into its cost–benefit analysis. A public sector owner could quite properly include the recreational benefits in its cost–benefit analysis. Again, as far as the private developer is concerned, the cost of labor is equal to the market rate of remuneration, no matter what the unemployment level. For the public developer however, in times of high unemployment, the economic cost of labor may be nil, since the use of labor in this project does not preclude the use

Answer 3):

a) **Normal Probability Distribution:**

The normal distribution is a probability distribution. As with any probability distribution, the proportion of the area that falls under the curve between two points on a probability distribution plot indicates the probability that a value will fall within that interval.

This will be the most important distribution in this class. You need to get very comfortable with dealing with the tables that describe probabilities associated with each distribution.

A random variable X whose distribution has the shape of a normal curve is called a normal random variable.

b) **Solution:**
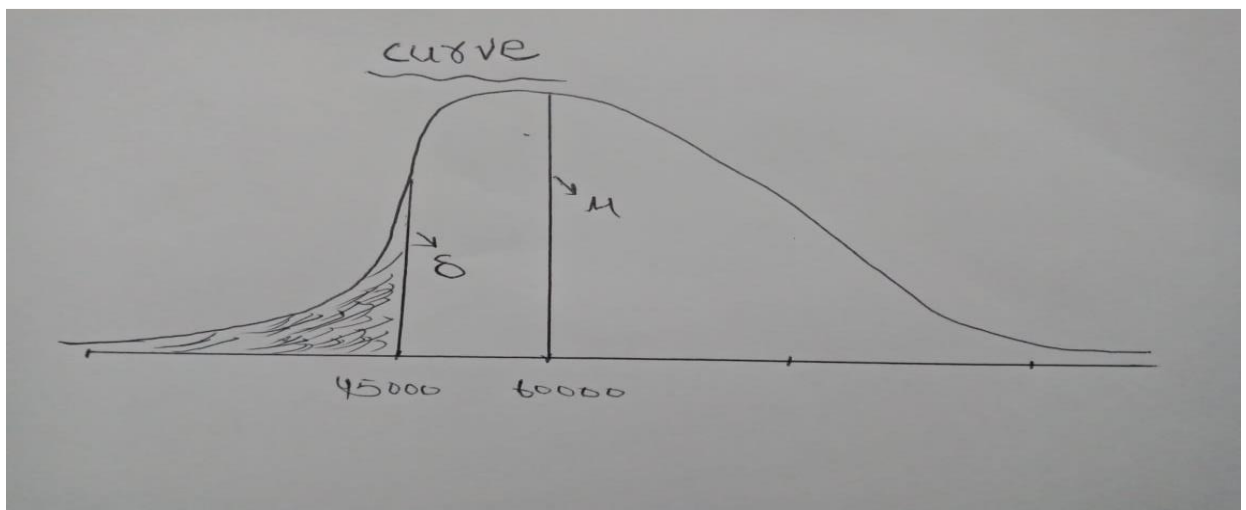
Population mean $\mu = 60000$ PKR

Population standard deviation $\sigma = 15000$ PKR

$x = 45000$

$z = x - \mu / \sigma = (45000-60000)/15000 = -1$

so from the table given below

$p\ (Z < -1) = .15866$

Probability is 15.866 %

And Area Percentage of The above curve is .15866 out of 1.00.

(The term "area" will refer to "area percentage".)

$p(Z < -1) + p(Z > +1) = 1$

$p(Z > +1) = 1 - p(Z < -1)$

$p(Z > +1) = 1 - .15866$

$p(Z > +1) = .84134$

Z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
-3.9	.00005	.00005	.00004	.00004	.00004	.00004	.00004	.00004	.00003	.00003
-3.8	.00007	.00007	.00007	.00006	.00006	.00006	.00006	.00005	.00005	.00005
-3.7	.00011	.00010	.00010	.00010	.00009	.00009	.00008	.00008	.00008	.00008
-3.6	.00016	.00015	.00015	.00014	.00014	.00013	.00013	.00012	.00012	.00011
-3.5	.00023	.00022	.00022	.00021	.00020	.00019	.00019	.00018	.00017	.00017
-3.4	.00034	.00032	.00031	.00030	.00029	.00028	.00027	.00026	.00025	.00024
-3.3	.00048	.00047	.00045	.00043	.00042	.00040	.00039	.00038	.00036	.00035
-3.2	.00069	.00066	.00064	.00062	.00060	.00058	.00056	.00054	.00052	.00050
-3.1	.00097	.00094	.00090	.00087	.00084	.00082	.00079	.00076	.00074	.00071
-3.0	.00135	.00131	.00126	.00122	.00118	.00114	.00111	.00107	.00104	.00100
-2.9	.00187	.00181	.00175	.00169	.00164	.00159	.00154	.00149	.00144	.00139
-2.8	.00256	.00248	.00240	.00233	.00226	.00219	.00212	.00205	.00199	.00193
-2.7	.00347	.00336	.00326	.00317	.00307	.00298	.00289	.00280	.00272	.00264
-2.6	.00466	.00453	.00440	.00427	.00415	.00402	.00391	.00379	.00368	.00357
-2.5	.00621	.00604	.00587	.00570	.00554	.00539	.00523	.00508	.00494	.00480
-2.4	.00820	.00798	.00776	.00755	.00734	.00714	.00695	.00676	.00657	.00639
-2.3	.01072	.01044	.01017	.00990	.00964	.00939	.00914	.00889	.00866	.00842
-2.2	.01390	.01355	.01321	.01287	.01255	.01222	.01191	.01160	.01130	.01101
-2.1	.01786	.01743	.01700	.01659	.01618	.01578	.01539	.01500	.01463	.01426
-2.0	.02275	.02222	.02169	.02118	.02068	.02018	.01970	.01923	.01876	.01831
-1.9	.02872	.02807	.02743	.02680	.02619	.02559	.02500	.02442	.02385	.02330
-1.8	.03593	.03515	.03438	.03362	.03288	.03216	.03144	.03074	.03005	.02938
-1.7	.04457	.04363	.04272	.04182	.04093	.04006	.03920	.03836	.03754	.03673
-1.6	.05480	.05370	.05262	.05155	.05050	.04947	.04846	.04746	.04648	.04551
-1.5	.06681	.06552	.06426	.06301	.06178	.06057	.05938	.05821	.05705	.05592
-1.4	.08076	.07927	.07780	.07636	.07493	.07353	.07215	.07078	.06944	.06811
-1.3	.09680	.09510	.09342	.09176	.09012	.08851	.08691	.08534	.08379	.08226
-1.2	.11507	.11314	.11123	.10935	.10749	.10565	.10383	.10204	.10027	.09853
-1.1	.13567	.13350	.13136	.12924	.12714	.12507	.12302	.12100	.11900	.11702
-1.0	.15866	.15625	.15386	.15151	.14917	.14686	.14457	.14231	.14007	.13786
-0.9	.18406	.18141	.17879	.17619	.17361	.17106	.16853	.16602	.16354	.16109
-0.8	.21186	.20897	.20611	.20327	.20045	.19766	.19489	.19215	.18943	.18673
-0.7	.24196	.23885	.23576	.23270	.22965	.22663	.22363	.22065	.21770	.21476
-0.6	.27425	.27093	.26763	.26435	.26109	.25785	.25463	.25143	.24825	.24510
-0.5	.30854	.30503	.30153	.29806	.29460	.29116	.28774	.28434	.28096	.27760
-0.4	.34458	.34090	.33724	.33360	.32997	.32636	.32276	.31918	.31561	.31207
-0.3	.38209	.37828	.37448	.37070	.36693	.36317	.35942	.35569	.35197	.34827
-0.2	.42074	.41683	.41294	.40905	.40517	.40129	.39743	.39358	.38974	.38591
-0.1	.46017	.45620	.45224	.44828	.44433	.44038	.43644	.43251	.42858	.42465
-0.0	.50000	.49601	.49202	.48803	.48405	.48006	.47608	.47210	.46812	.46414