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ANALYSIS ON COST OVERRUN IN CONSTRUCTION PROJECTS IN KASHMIR VALLEY

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Abstract - *Construction activity is an integral part of country's infrastructure and industrial development and is poised for further growth on account of industrialization, urbanization, economic development and people's rising expectations for improved quality of living. Cost is one of the major considerations throughout the lifecycle of a project. Unfortunately, most of the projects fail to achieve project completion within the estimated cost. This is a major problem both in developed and developing countries as well as in states and union territories. To identify and evaluate the causes of cost overrun, a questionnaire survey was conducted using Likert scale (1-5) based on frequency of occurrence in different projects in Kashmir province of Jammu and Kashmir. The main purpose of this research is to identify the most frequently occurring causes in distinct projects that lead to cost overrun in construction projects in Kashmir Valley. As per the findings of this research the root causes of cost overrun in Kashmir valley are Corruption, lack of availability of funds/poor economic conditions, payment delays, inaccurate evaluation of project duration and cost, land acquisition and delay in government procedures. This research will be helpful to the construction concerned parties to be aware of frequently occurring causes of cost overrun at every stage of construction and will further help in trying to reduce the cost overrun in every construction project.*

Key Words: **Kashmir, Overrun, questionnaire, frequency of occurrence, infrastructure.**

1. INTRODUCTION

The construction industry is an integral part of any country's economy and its growth. It is the second largest industry of the country after agriculture. It plays a crucial role in developing the country's infrastructure and provides huge employment to the people, employs over 30 million people. Construction activity is poised for further growth on account of industrialization, urbanization, economic development and people's rising expectations for improved quality of living. It includes hospitals, schools, townships, offices, houses and other buildings; urban infrastructure (including water supply, sewerage, drainage); highways, roads, ports, railways, airports, power systems; irrigation and agriculture systems, telecommunications, etc. Covering as it does, such a wide spectrum, construction becomes the basic input for socio-economic development. Construction industry consumes 40-50% of the National Plan outlay and it accounts for about 8-10% of India as GDP (Gross Domestic Product) and 78% to the gross capital formation.

The importance of the sector is further highlighted by a few key facts. Construction is the second largest employer and contributor to GDP. In fact, as per the economic survey, the rate of growth at factor cost on prices levels of 2004-05, construction has grown at 6.5% in 2009-10. Additionally, of the total investment in infrastructure 65% is accounted for construction activity. In 2009, Indian construction was the ninth largest market in the world estimated at $246.5 billion and accounting for 3.3% of global market share, as per the Global Construction 2020 report by Oxford Economics. In January 2019, India's construction sector had a contribution of over 2.7 trillion Indian rupees to the country's GDP, this was all time high contribution recorded through the sector

1.1 Cost Overrun

Cost overrun is defined as excess of actual cost over budget. Cost overrun is also sometimes called "cost escalation," "cost increase," or "budget overrun." Cost overrun is also defined as the change in contract amount divided by the original contract award amount .This calculation can be converted to a percentage for ease of comparison.

$$\text{Cost overrun (\%)} = \frac{\text{Final – Original) Contract Amount}}{\text{Original Contract Amount}} \times 100$$

1.2 Problem Statement

Cost is one of the major considerations throughout the lifecycle of a project. Unfortunately, most of the projects fail to achieve project completion within the estimated cost. Besides time overrun, cost overrun is also a serious problem in the construction industry in every region. This is a major problem both in developed and developing states. The trend is more significant in developing states and countries, where these overruns sometimes exceeds 100% of the anticipated cost of the project.

1.3 Research Objective:

The main objectives include:

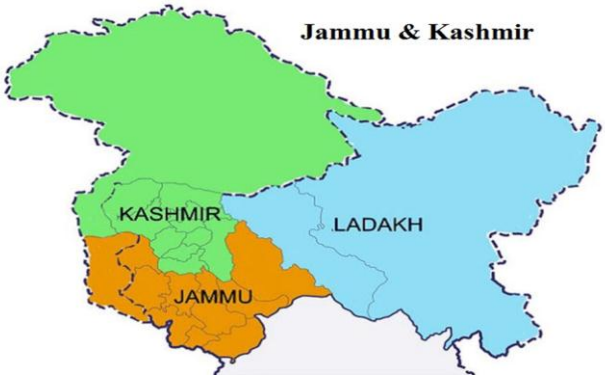
- The primary objective of analysis is to investigate the major causes of cost overrun that occur frequently in construction projects in Jammu and Kashmir.
- To assess the frequency of occurrence of each of these causes of cost overrun.
- To analyze and rank the set of causes as per the responses received from the respondents.
- To minimize or to avoid cost overrun and frequency of its occurrence and to reduce its significant impacts on construction projects in Kashmir Valley.

1.4 Research Area

Kashmir is the northernmost geographical region of Indian subcontinent. The term "Kashmir" denoted only the Kashmir valley between the Great Himalayas and the Pir Panjal Range. Today Kashmir is a region of union territory of Jammu and Kashmir. The union territory of Jammu and Kashmir has area of 222,236 km square with a population of 1.25crore.

Failure of Jammu and Kashmir Government and its engaged executing agencies to complete ten mega infrastructure projects on time in the state has resulted in cost overrun of 102 percent from Rs 25,238 crore to Rs 51,229 crore over the years. According to figures compiled by Central government, the ten projects with a cost of over Rs 150 crore in J&K are facing time and cost overrun resulting in whopping cost rise of these projects by over 102 percent.

Figure 1: Research Territory



2. LITERATURE REVIEW

1. Dhanashree S Tejala, et al (May 2015) has identified and analyzed causes of cost overrun in construction industry in Pune region. It was observed the factors for cost overrun are as follows:

- Material shortage
- Shortage of labor
- Late delivery of materials and equipment
- Unavailability of competent staff
- Low productivity level of labors
- Quality of equipment and raw material etc.

2. Ghulam Abbas Niazi (2017) stated that a structured questionnaire survey was used to collect data in Afghanistan. A total of 75 sets of questionnaire was distributed to selected clients, contractors and consultants, with 51 valid returns received and analyzed. It was found that the most significant causes of cost overrun in Afghanistan construction industry are

- Corruption,
- Delay in progress payments by clients,
- Difficulties in financing project by contractors,
- Security, and
- Change order by clients during the construction phase.

3. Aishwarya Prashant Patil (Nov 2017) has done "Analysis of cost overrun in construction projects" and explained that cost overrun occurs in every construction project but the magnitude varies significantly from project to project. For analysis of cost overrun a case study of MJM hospital, Pune extension of construction work for 3 floor above Existing building was done. During analysis some factors causing cost overrun were identified are as follows:

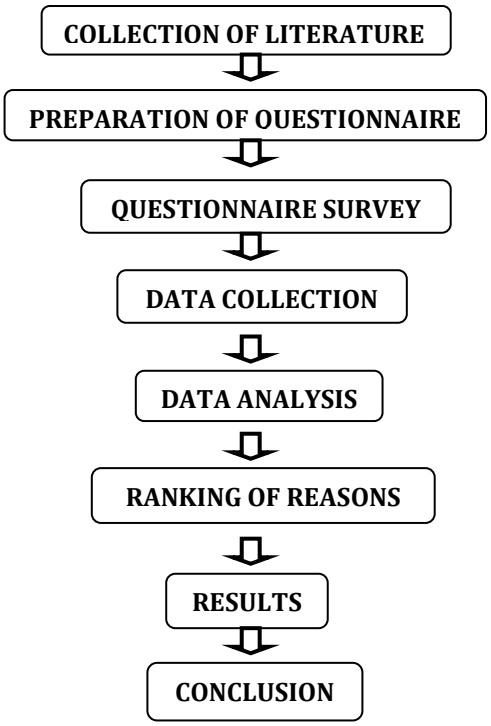
- Delay in progress payment
- Inaccurate planning and scheduling of project by contractors
- Rainy weather
- Excessive work in hands of contractors
- Poor liquidity of contractors
- Shortage of labours
- Delay in approving extra work and variation
- Poor site management and supervision

4. Ahmad Senouci et al. (2016) have explained cost overruns and delays in Qatari public construction projects. The data collected from the Qatar public work authority ASHGHAL includes 122 public road, building and drainage projects. Regression analysis was used to establish the relationships between contract prices and cost overruns and to predict models for calculating overruns. The cost overruns were not significant at a significance level of 0.05 with respect to the project duration. However the delays were statistically significant at a significance level of 0.05 with respect to the project duration, which means the cost overrun in construction projects completed between 2007 and 2013 are lower than those completed between 2000 and 2007.

3. METHODOLOGY

Research methodology determines a solution to a particular problem in a step by step manner. After determination of the problem, the data and information sources were identified. A questionnaire was structured after the in-depth literature review. The data was collected, analyzed and the results were presented.

Figure 2: Flowchart diagram



4. DATA COLLECTION AND DATA ANALYSIS

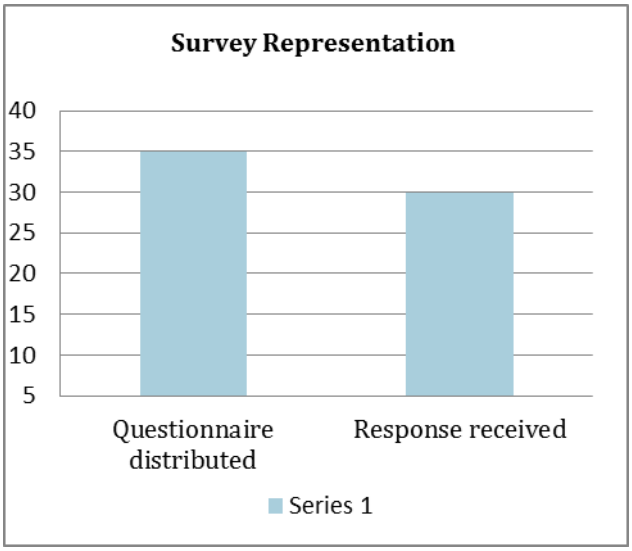
4.1 Data Collection

A questionnaire survey was carried out among the two major construction bodies namely Government and private. The constructers such as contractors, engineers, owners, project coordinators, project managers, sub-contractors etc involved in the survey had sea of knowledge and were experienced in handling different types of projects like roads, buildings, bridges, flyovers, etc. A total set of 35 questionnaire papers were prepared and were distributed by visiting homes and offices of concerned bodies. The total numbers of responses received were 30. The reliability of the survey results is expected to be high because all the respondents were deeply knowledgeable and highly experienced as well as were acquiring higher posts in their departments

Table -1: Percentage of response received

Total questionnaire distributed	Total responses received	Percentage of responses Received
35	30	85.71

Figure 3: Chart Representation



4.2 Analysis Methods

1. Relative Importance Index

RII value can be calculated using the following equation:

$$\text{Relative Importance Index (RII)} = \left[\frac{\sum w}{A \times N} \right]$$

Where:

W → weightage given to each reason by the respondent's ranging from 1-5

A → Highest weight (i.e. 5 in our case)

N → Total number of respondent's

Table 2: Relative importance index calculation sheet

S No.	REASONS OF COST OVERRUN	Total Score	RII
1.	Material shortage in the market	62	0.4133
2.	Shortage of labours	75	0.50
3.	Low productivity level of labours	85	0.5667
4.	Cash flow and financial difficulties faced by contractor	96	0.64
5.	Payment delays	113	0.7533
6.	Escalation and fluctuation of building material prices	100	0.6667
7.	Lack of coordination and communication between construction parties	73	0.4867
8.	Mistakes in design and drawings	59	0.3933
9.	Frequent design changes	58	0.3867
10.	Inaccurate evaluation of project duration and cost	110	0.7333
11.	Tax liabilities	56	0.3733
12.	Conflict between project parties	63	0.42
13.	Uneven weather conditions	103	0.6867
14.	Lack of proper professional software	68	0.4533
15.	Land acquisition	113	0.7533
16.	Delay in government procedures	112	0.7467
17.	Amendments in work due to error in design	61	0.4067
18.	Lack of skilled workers to operate special equipment's	83	0.5533
19.	Outdated/obsolete construction methods	80	0.5333
20.	Improper project planning and scheduling.	84	0.56
21.	No pre-construction planning of project tasks.	81	0.54
22.	Use of obsolete technology.	90	0.60
23.	Lack of effective site management and supervision.	78	0.52
24.	Use of poor quality of materials initially, leading to reconstruction.	65	0.4333
25.	Lack of maintenance of equipment's and materials at site	74	0.4933
26.	Additional work.	92	0.6133
27.	Mistakes during construction by contractors.	73	0.4867
28.	Wastage on site.	85	0.5667
29.	Poor experience of constructors.	76	0.5067
30.	Construction equipment shortage	77	0.5133
31.	Corruption.	125	0.8333
32.	Delay in material delivery.	79	0.5267
33.	Unskilled manpower.	80	0.5333
34.	Frequent change of heads.	75	0.5000
35.	Natural disasters.	68	0.4533

36.	Utility issues, i.e. shifting of utilities.	87	0.58
37.	Delay in procuring and arrangement of construction equipment's by constructors.	83	0.5533
38.	Lack of inventory.	80	0.5333
39.	Change in design at the time of construction.	63	0.42
40.	Location of site.	103	0.6867
41.	Large number of participants within the project.	77	0.5133
42.	Delay in possession of site	104	0.6933
43.	Lack of availability of funds/ poor economic conditions.	122	0.8133

2. The reasons of cost overrun are rearranged and ranked in hierarchical order based on Relative Importance Index in table 3.

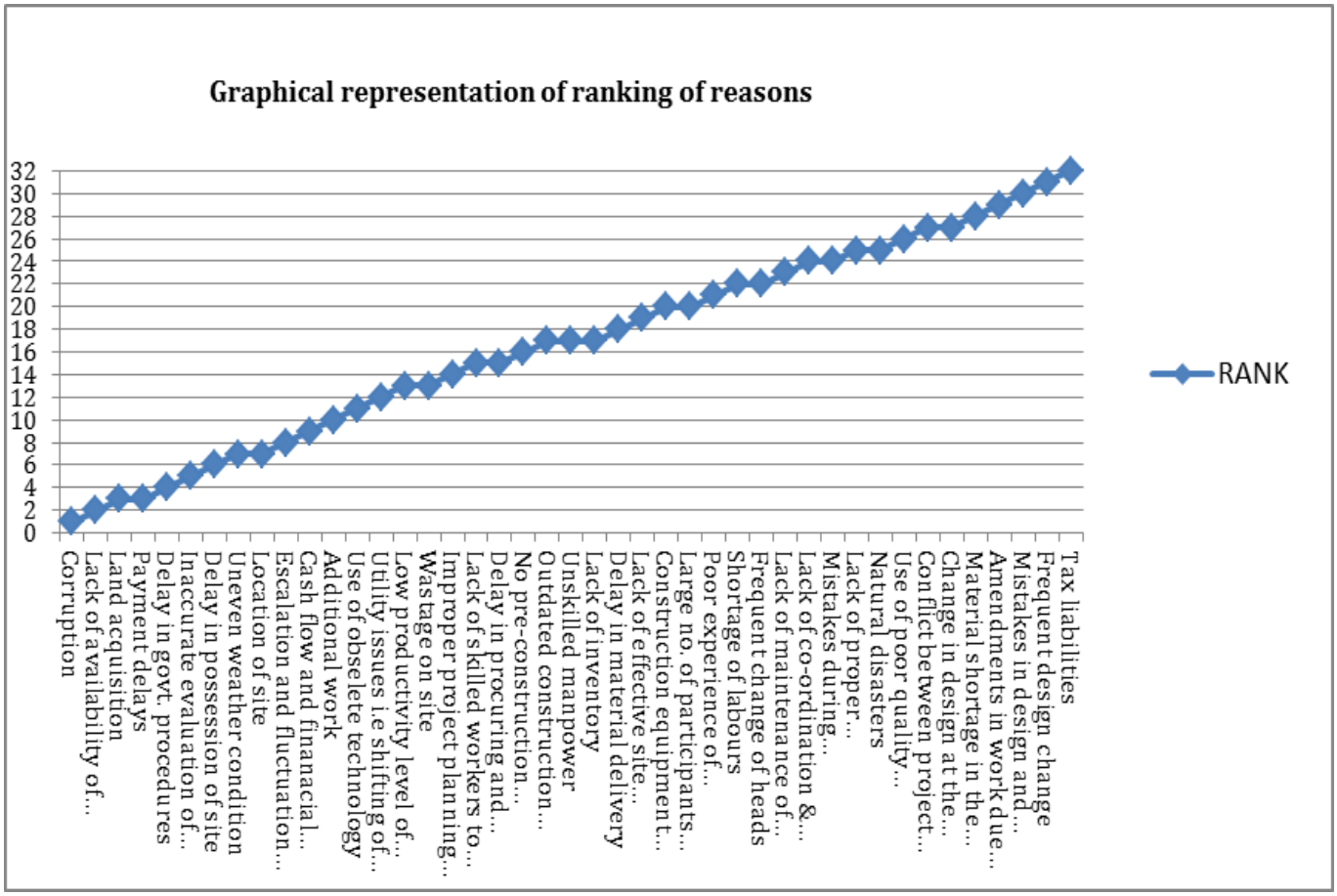
3. Figure 4 shows the graphical representation of ranking of cost overrun reasons.

Table 3: Ranking of reasons of cost overrun

S No.	REASONS OF COST OVERRUN	RII	RANK
1.	Corruption	0.8333	1
2.	Lack of availability of funds/ poor economic conditions.	0.8133	2
3.	Land acquisition.	0.7533	3
4.	Payment delays.	0.7533	3
5.	Delay in government procedures.	0.7467	4
6.	Inaccurate evaluation of project duration and cost.	0.7333	5
7.	Delay in possession of site.	0.6933	6
8.	Uneven weather condition.	0.6867	7
9.	Location od site.	0.6867	7
10.	Escalation and fluctuation of building material prices.	0.6667	8
11.	Cash flow and financial difficulties faced by contractor.	0.6400	9
12.	Additional work.	0.6133	10
13.	Use of obsolete technology.	0.6000	11
14.	Utility issues, i.e. shifting of utilities.	0.5800	12
15.	Low productivity level of labours.	0.5667	13
16.	Wastage on site.	0.5667	13
17.	Improper project planning and scheduling.	0.5600	14
18.	Lack of skilled workers to operate special equipment's.	0.5533	15
19.	Delay in procuring and arrangement of construction equipment's by contractors.	0.5533	15

20.	No pre-construction planning of project tasks.	0.5400	16
21.	Outdated/obsolete construction methods.	0.5333	17
22.	Unskilled manpower.	0.5333	17
23.	Lack of inventory.	0.5333	17
24.	Delay in material delivery.	0.5267	18
25.	Lack of effective site management and supervision.	0.5200	19
26.	Construction equipment shortage.	0.5133	20
27.	Large number of participants within the project.	0.5133	20
28.	Poor experience of constructors.	0.5067	21
29.	Shortage of labours.	0.5000	22
30.	Frequent change of heads.	0.5000	22
31.	Lack of maintenance of equipment's and materials at site.	0.4933	23
32.	Lack of co-ordination and communication between construction parties.	0.4867	24
33.	Mistakes during construction by contractors.	0.4867	24
34.	Lack of proper professional software.	0.4533	25
35.	Natural disasters.	0.4533	25
36.	Use of poor quality of materials initially leading to reconstruction.	0.4333	26
37.	Conflict between project parties.	0.4200	27
38.	Change in design at the time of construction.	0.4200	27
39.	Material shortage in the market.	0.4133	28
40.	Amendments in work due to error in design.	0.4067	29
41.	Mistakes in design and drawing.	0.3933	30
42.	Frequent design change.	0.3867	31
43.	Tax liabilities.	0.3733	32

Figure 4: Graphical representation of ranking of reasons of cost overrun.



4 Further using Pareto analysis as shown in table 4 for obtaining cumulative index and cumulative percentage of each reason, after obtaining relative importance index.

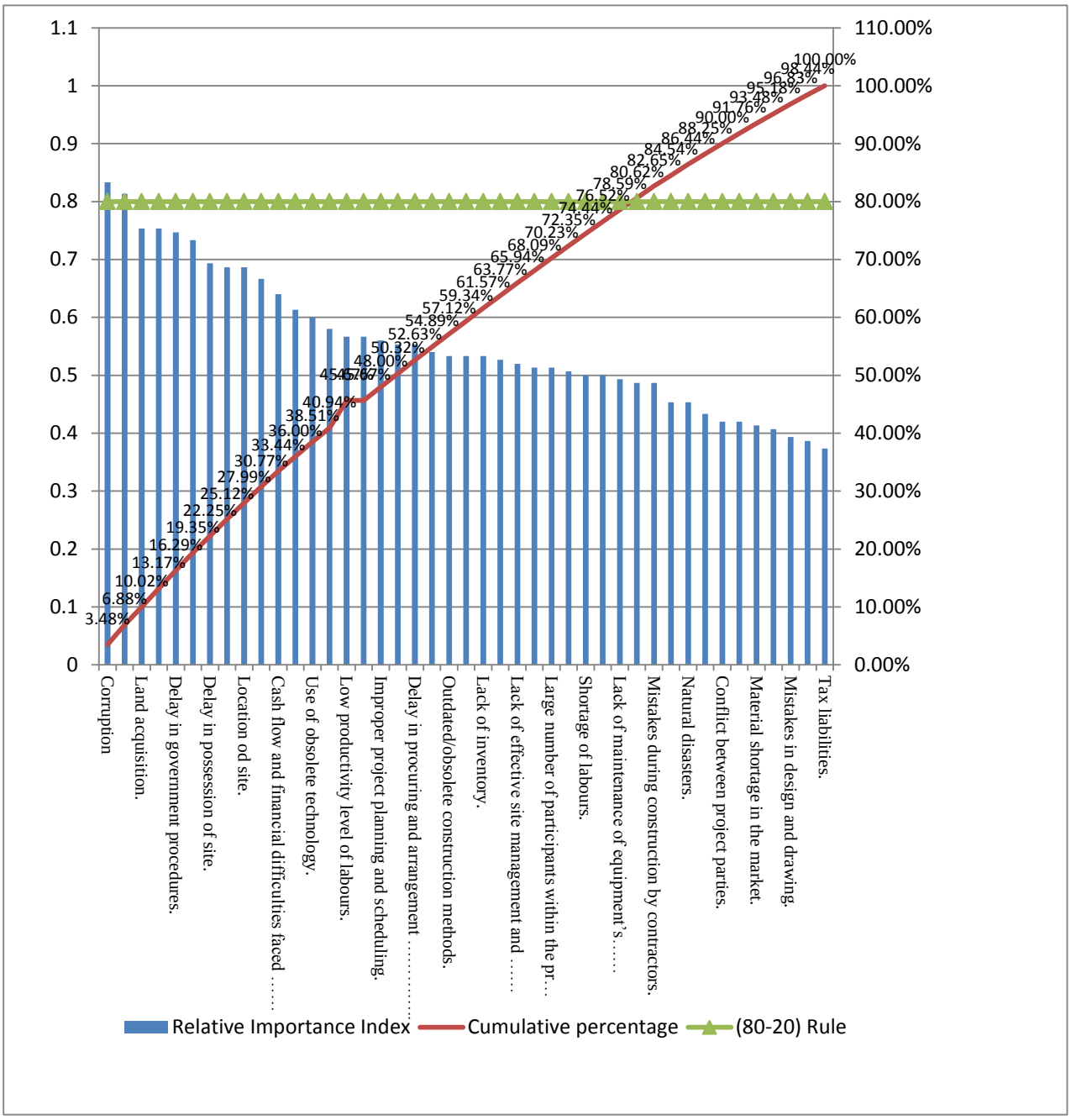
5. Figure 5 shows the graphical representation of Pareto analysis in which relative importance index, cumulative percentage of RII, and reasons are shown on primary axis, secondary axis and horizontal axis respectively.

Table 4: Pareto Analysis calculation sheet

S .No	Reasons of cost overrun	Relative Importance Index	Cumulative Index	Cumulative Percentage
1	Corruption	0.8333	0.8333	3.48%
2	Lack of availability of funds/ poor economic conditions.	0.8133	1.6466	6.88%
3	Land acquisition.	0.7533	2.3999	10.02%
4	Payment delays.	0.7533	3.1532	13.17%
5	Delay in government procedures.	0.7467	3.8999	16.29%
6	Inaccurate evaluation of project duration and cost.	0.7333	4.6332	19.35%
7	Delay in possession of site.	0.6933	5.3265	22.25%
8	Uneven weather condition.	0.6867	6.0132	25.12%
9	Location od site.	0.6867	6.6999	27.99%
10	Escalation and fluctuation of building material prices.	0.6667	7.3666	30.77%
11	Cash flow and financial difficulties faced by contractor.	0.6400	8.0066	33.44%
12	Additional work.	0.6133	8.6199	36.00%
13	Use of obsolete technology.	0.6000	9.2199	38.51%
14	Utility issues, i.e shifting of utilities.	0.5800	9.7999	40.94%
15	Low productivity level of labours.	0.5667	10.3666	45.67%

16	Wastage on site.	0.5667	10.9333	45.67%
17	Improper project planning and scheduling.	0.5600	11.4933	48.00%
18	Lack of skilled workers to operate special equipment's.	0.5533	12.0466	50.32%
19	Delay in procuring and arrangement of construction equipment's by contractors.	0.5533	12.5999	52.63%
20	No pre-construction planning of project tasks.	0.5400	13.1399	54.89%
21	Outdated/obsolete construction methods.	0.5333	13.6732	57.12%
22	Unskilled manpower.	0.5333	14.2065	59.34%
23	Lack of inventory.	0.5333	14.7398	61.57%
24	Delay in material delivery.	0.5267	15.2665	63.77%
25	Lack of effective site management and supervision.	0.5200	15.7865	65.94%
26	Construction equipment shortage.	0.5133	16.2998	68.09%
27	Large number of participants within the project.	0.5133	16.8131	70.23%
28	Poor experience of constructors.	0.5067	17.3198	72.35%
29	Shortage of labours.	0.5000	17.8198	74.44%
30	Frequent change of heads.	0.5000	18.3198	76.52%
31	Lack of maintenance of equipment's and materials at site.	0.4933	18.8131	78.59%
32	Lack of co-ordination and communication between construction parties.	0.4867	19.2998	80.62%
33	Mistakes during construction by contractors.	0.4867	19.7865	82.65%
34	Lack of proper professional software.	0.4533	20.2398	84.54%
35	Natural disasters.	0.4533	20.6931	86.44%
36	Use of poor quality of materials initially leading to reconstruction.	0.4333	21.1264	88.25%
37	Conflict between project parties.	0.4200	21.5464	90.00%
38	Change in design at the time of construction.	0.4200	21.9664	91.76%
39	Material shortage in the market.	0.4133	22.3797	93.48%
40	Amendments in work due to error in design.	0.4067	22.7864	95.18%
41	Mistakes in design and drawing.	0.3933	23.1797	96.83%
42	Frequent design change.	0.3867	23.5664	98.44%
43	Tax liabilities.	0.3733	23.9397	100.00%
	TOTAL	**23.9397**		

Figure 5: Graphical Representation of Pareto Analysis

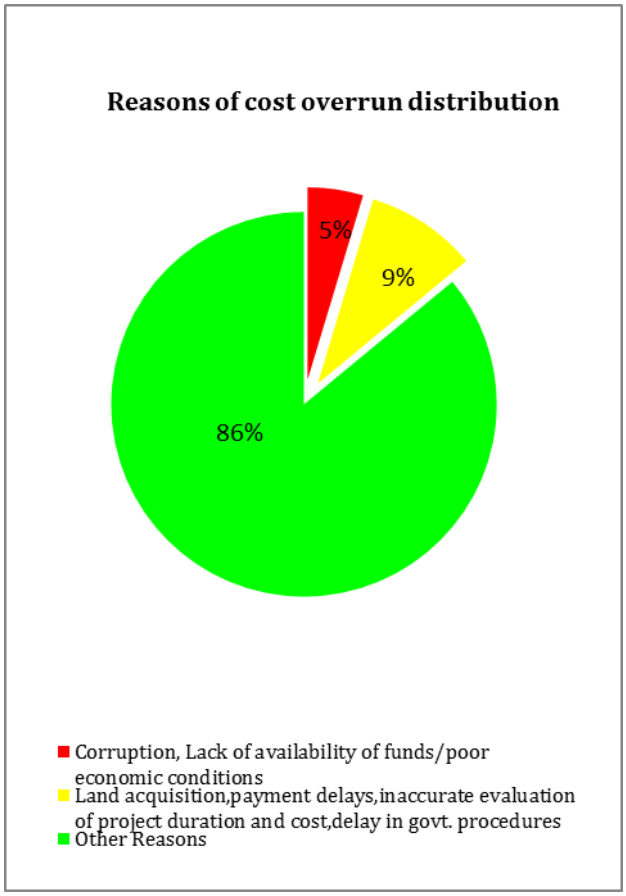


5. RESULTS AND DISCUSSIONS

A questionnaire survey was conducted with 30 number of respondents out of 35.The rate of response is 85.71 percentile. The data is elaborated, analyzed and presented using Relative importance index method. The relative importance index values shows that the major causes which occur frequently in Kashmir division are Corruption, lack of availability of funds/poor economic conditions, land acquisition, payment delays, in accurate evaluation of project duration and cost and delay in government procedures, as all of these reasons have occurrence percentage of above 70%.

Further with the use of Pareto analysis it is identified that the most significant and inevitable causes of cost overrun in the said region are Corruption and lack of availability of funds/poor economic conditions as both of them bear percentage of occurrence above 80%.

Figure 6: Final percentage distribution of cost overrun reasons



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