

# Inquisition on Cost & Time Overrun in Road Construction Projects in Kashmir.



Amir Bashir, Sandeep Singla, Manish Kaushal

**Abstract:** *The success of the project is generally acknowledged by the fact whether the project is completed within the time and budget. There are many challenges in this for completion of project within time and budget, this result in poor performance of project often. The construction cost and time overrun is most substantial problem in Jammu and Kashmir. This problem is faced by all parties like contractors, clients, subcontractors and suppliers. The aim of this research study is to find out factors that leads to cost and time overrun in road construction projects in Jammu and Kashmir. The results of this research shows the key factors that cause cost and time overrun in road construction projects in Jammu and Kashmir are Land acquisition problems, payment delay for completed work, delay in shifting of utilities inclement weather conditions, Security situation, design changes during construction, Lack of modern technology and market inflations*

**Keyword:** *project acknowledged construction, Kashmir.*

## I. INTRODUCTION

### 1.1 Introduction

The road network of India is the second largest road network in the world after USA. India has a road network of over 5,603,293 kilometers as of 31 march 2016. India has 1.70 Km of roads per square km of land. The quantitative density of roads in India is higher than Japan (0.91 km) and USA (0.99 km). Adjusted for its population India has 4.63 km of roads per 1000 people. Qualitatively India has mix of modern highways and narrow unpaved roads. Road construction industry in Jammu and Kashmir is not able to complete the projects within the budget and time, which is major cause of concern. Worldwide Cost & time overrun is a common problem, In Jammu & Kashmir it is also a significant challenge . The road construction industry is a significant contributor of economic and social development in developed and developing countries. As the J&K road construction industry continues to grow in size, it is even more important to finish projects within planned budget. Unfortunately, most road construction projects still fail to meet the deadlines and also exceed initial estimated budget. Flyvbjerg et al.[1] indicates that construction cost overruns is a major challenge, where 9 out of 10 construction projects encounter cost overruns. Moreover, the cost overrun can be as high as 183% more than planned estimated budget.

The Road Construction industry in developed countries, including the United Kingdom also suffer from cost overrun because about one third of employers complain that construction projects experience budget overrun . Furthermore, the clients reported that nearly sixty percent of the projects did not meet the planned budget. Cost overrun in the UK road construction industry has become a common problem [2]. In developing countries, like India, the road construction industry is the backbone of the economic and social development. The road construction industry is a significant contributor to the economic development of Kashmir,95% of trade is done through road transportation. Kashmir is landlocked from every side, hence there are no means of water transportation. Kashmir is surrounded by Pakistan, Afghanistan and China from 3 sides. The only way of communication is by road. The road network is jugular vein of Kashmir's economy. The road construction industry thus is an important in development of Kashmir, but encounters with various challenges, such as lack of productivity, cost overruns and client dissatisfaction. Such issues significantly affect the economic development of the region. The aim of this research, therefore, is to assess and identify the critical factors that result in cost & time overruns in J&K road construction projects. We have chosen 3 major road projects of Jammu and Kashmir for study. The introduction to these projects is as follows.

- Jammu-Srinagar National highway fourlaning.
- Srinagar flyover (Jahangir Chowk –Rambagh).
- Srinagar City Ring road.

### 1.2 Definition of Cost Overrun and time overrun

The deviations between the originally estimated cost and stipulated time during designing and planning stage and the actual budget spent and time taken for completion of project is called as cost and time overrun. The cost overrun in simple words can be defined the extra cost incurred for construction of any project other than the already estimated cost during designing stage. The timer overrun means the extra time taken for the completion of the project than the stipulated time for its completion. The overrun will affect the project completion drastically and causes many issues also. It is important to control the cost and time overrun for the better performance of the project. This is why there was a need of study the problem of cost and time overrun in road construction projects in Jammu and Kashmir. An honest attempt has been made to study the causes of cost and time overrun in road construction projects in Jammu and Kashmir, So that the extra cost and time may be avoided.

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\* Correspondence Author

**Dr Sandeep Singla\***, Professor and Head of Department of Civil Engineering RIMT University Punjab India.

**Manish Kaushal**, Assistant Professor, Department of Civil Engineering, RIMT University, Punjab, India.

**Amir Bashir**, Department of Civil Engineering, RIMT University, Punjab, India.

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## 1.3 Cost Control of Project

Cost control is a challenging task in budget of any project. It provides information and details related to cost for taking decisions to complete the project in a predefined quantity of Resources, within the budget and in time. Information is extracted from various sources and performance data is used for minimizing wastages, forecasting cost trends, updating current situation of budget and taking future decisions. Cost control involves the study and processing of reports and details of cost accounts taken from different operation divisions, comparing it with standards, checking the deviations and finding the reasons for deviations and drawing results to monitor the project and for future references

## 1.4 Objective of the study

Road construction industry is the backbone of economy of state of J&K. Road connectivity is the only way by which Kashmir is connected with rest of country. The road construction is vital for development of the state, but we have seen that these projects are not completed within the stipulated cost and time. The objectives of my study are

- To investigate the presence of cost and time overrun in road construction projects in Kashmir. The major projects to be investigated are
  - 1) Jammu-Srinagar national highway
  - 2) Srinagar flyover (Jahangir chowk-Rambagh)
  - 3) Srinagar city ring road.
- To investigate the reasons that trigger the cost and time overrun in road construction projects in Kashmir.
- To analyze a questionnaire to investigate the existence and reasons of cost and time overrun in road construction projects in J&K
- To recognize the most important factors of cost and time overrun in road construction projects in Kashmir.

## II. LITERATURE REVIEW

### 2.1 General

A major factor in project success is completion on budget. Furthermore, cost performance is the key measurement of an organization's productivity and profitability. Project cost overrun is measured as the difference between the planned cost (estimate) and actual construction cost on completion. The Road construction industry in J&K is generally unable to complete projects within the original estimated cost. A number studies have been conducted to address the issue and factors that cause project cost and time overruns.

**Hazim et al. (2017)** [3] this study was conducted in Jordan. The study focused on the factors that may cause time overrun in project. The study was conducted on the 40 public infrastructure projects implemented during the period between 2000 and 2008, the data was collected and analysed. The final reports for this study were collected Ministry of Public Works and Housing (MPHW) of Jordan, which looks after infrastructure projects in Amman capital of Jordan. This study showed that 20 factors were responsible for time overrun in these projects. The reports show that the weather and the terrain are most significant factors that cause the time overrun in construction projects in Jordan.

**Rajakumar A C (2016)**[4] The study was conducted by Meenakshi Sundararajan Engineering College, Chennai 24. The study was focused on finding the factors that cause the cost overrun in road construction projects in India. A thorough literature survey was done and some of the prime factors were established. To validate these factors a questionnaire survey was conducted and then the data was analysed. He used the RII Relative importance index to rank the factors according to their significance. According to this study the most significant factors that cause the cost overrun are delay in progress payments, natural disasters and shifting of utilities.

**Ghulam Abbas Niazi et al. (2015)**[5] studied the cost overruns in construction industries in Afghanistan. He came up with 75 most significant factors that are cause of cost overrun in construction industries in Afghanistan. He used a questionnaire to survey, contractors, clients, suppliers and other government officials were approached for this investigation. .RII (Relative Importance Index) method was used for analysis. According to them the most significant factor was corruption with RII value 0.89.

**T.Subramani, P.S.Sruthi and M.Kavitha (2014)**,[6] The research study was conducted in India, the main focus of this study were the road projects in India. They study found that inadequate formulation of project, lack of proper field investigation, improper cost estimates, inefficient planning while executing the project, improper supply of equipment, inefficient project management at execution stage, frequent changes of law and order were the main factors contributing for the cost overruns of road construction projects in India.

**Abdullah Alhomidan (2013)**,[7] The research study was focused on the 41 main reasons which were triggering the cost overrun in road construction projects, and a survey was conducted to find out the most significant factors. The study concluded that Delays in payment, lack of communications between contractors and project parties, improper decision making and internal problems in administration were main reasons for cost overrun in road construction projects.

**Ibrahim Mahamid (2013)**,[8] This research study Focused on the 45 causes that cause construction delays in West Bank of Palestine. A questionnaire survey was conducted for this study and the results of that survey found the main factors for cost overrun in Palestine are Division of West Bank and its political situation, lack of communication between parties involved in project, inefficient equipment and completions in tendering.

**Eng. S.B.Wijekoon (2011)**,[9] This study was focused on finding the main reasons that are most significant in causing cost overrun in Eastern and Northern province of Sri Lanka. He conducted a questionnaire survey based on 19 factors across the country. This study concluded the prime reasons for cost overrun are late in shifting existing utilities,

Escalations in cost, and frequent changes in design during construction, delay in land acquisition.

According to *Chitkara (2011)[10]* According to this study, cost is defined as the amount that the client has agreed to pay for the project. Cost overrun is defined as the the total amount used for the completion of the project minus the amount that was agreed by client. The positive difference between the total expenditure and agreed amount is called cost overrun.

*Hamazah et al. (2011)[11]* According to this study delay can be defined as the extra time taken for the completion of the project. In other it is the total time taken to complete the project minus the actual stipulated time that was estimated at the time of designing the project, this delay in project completion is called as time overrun in Malaysia construction delay can't be prevented. This study says delays are of two types excusable delay and non-excusable delay.

*Shaikh et al. (2010)[12]* This study was focused on developing a mathematical model and identifying the most critical causes of delay in construction projects. This study says delay is most important factor which impacts the cost of the projects in construction industry. He conducted surveys for delays in very high rise building construction projects in every country of the world. This study has proposed four factors for delay that cause time overrun in development projects, the factors contractor issues, client issues, resource issues, and general problems.

*Bent Flyvbjerg, et and all (2004), [13]*The research was conducted on 258 road and rail infrastructure projects which costs around 90 billion US dollars. The focus of this study was on 3 major factors for the cost overruns. They concentrated on the factors s like duration of project implementation, size of the project, project ownership type. This study found that the major reasons and risks for cost overrun were caused by Duration and size of the project. Final conclusion of the study was that public ownership more critical in the type of ownership.

### III. METHODOLOGY

For this research we have applied the quantitative method to evaluate the perceptions of stakeholders in road construction industry in J&K on factors that result in cost & time overruns. The study was done in few steps.

1) First of all we did a thorough literature survey to study the trends in cost and time overrun in construction industries all over the world..

2) After that a thorough investigation was carried out to check the presence of cost and time overruns in road constructions projects in Jammu and Kashmir. We have chosen three major projects of Kashmir region as a sample for our study. These projects are as under

- 1) Jammu-Srinagar national highway
- 2) Srinagar flyover (Jahangir chowk-Rambagh)
- 3) Srinagar city ring road.

3) An investigation was carried into these projects and some other small projects also. After an in depth investigations of these projects the factors that caused cost and time overrun were established.

4) A questionnaire was developed and used to identify the significant causes influencing cost & time overruns in road construction projects in Kashmir.

5) The ordinal scale was used to measure the data from questionnaire survey. The ordinal scale for this research was adopted. The Likert scale of five ordinal measures from 1 to 5 according to the level of contribution used where; 1 indicates not significant, 2 slightly significant, 3 moderately significant, 4 very significant, and 5 extremely significant.

o Before collecting the data, interviews were conducted with various professionals involved in the J&K .Road Construction industry. The main reason for conducting interviews was to verify whether the questions were relevant in respect to the objectives of the study. The questionnaire was then circulated to 50 construction related persons, including clients, consultants and contractors.

o .In this research study we have used Relative Importance Index (RII) to rank the causes of cost and time overrun in road construction projects of Jammu and Kashmir. The RII value was calculated by the following equation

$$RII = \frac{\sum_{i=1}^5 w_i x_i}{A \times N}$$

Where:

*RII* – Relative Importance Index

*w* –Weighting given to each factor by the respondents and ranges from 1 to 5

*x* – Frequency of i-th response given for each cause

*A* – Highest weight (i.e. 5 in this case)

*N* – Total number of respondents.

#### 4.1 AREA OF STUDY

The area of study for this for this investigation are the road construction projects of Jammu and Kashmir, that have been completed recently or still in progress. We have chosen three major road construction projects of Kashmir division as the sample for this study. These projects are

1. Jammu- Srinagar National Highway
2. Srinagar flyover (Jahangir chowk –Rambagh)
3. Srinagar city ring road.

Apart from these projects many small projects were also investigated for presence of cost and time overrun. After a thorough investigation into these projects it was found there is massive cost and time overrun in these projects. These details of the investigation for these projects are given below.

#### 4.2 Jammu-Srinagar National Highway

The Jammu-Srinagar National Highway is the northernmost segment of NH 44 (formerly NH 1A before the renumbering of all national highways). It runs from Srinagar in the Kashmir Valley to the Jammu city. After the investigation we came to there is huge cost and time overrun already in this project and it is still not completed yet. The Kashmir phase of this project was supposed to be completed by 2016 and is still not completed. The cost overrun for this project is already estimated as more than 100 crores as of now and the work is still in progress. After the presence of cost and time overrun found in this project we studied the main causes that triggered the cost and time overrun in this project.

## Inquisition on Cost & Time Overrun in Road Construction Projects in Kashmir.

After a thorough investigations and questionnaire survey we found the factors that are prevalent in causing this cost and time overrun. The prime factors of overrun in this project are as follows.

1. Non availability of resources in locality.
2. Lack of machinery
3. Inclement weather situations
4. Frequent landslides
5. Unexpectedly long winters in last few years
6. Unavailability of labor.
7. Improper utilization of available resources.
8. Delay in payments of already completed works.
9. Complicated topographical conditions.
10. Shortage of Construction equipment.
11. Lack of technical staff.

### 4.3 Srinagar Flyover (Jahangir chowk-Rambagh)

The Srinagar Flyover was proposed in 2010 for the Srinagar city. After the topographical surveys this project was proposed with purpose of getting rid of traffic mess in Srinagar. The plan was proposed to JKERA on 04/08/2010. The structural designs of this project were reviewed and approved by IIT Roorkee in April 2011. This project starts from Jahangir chowk to Barzulla bridge. It moves through the congested area of Srinagar city along Airport road. This flyover is 2.50 Km long. This project was supposed to be completed by 2016, but suffered numerous delays in its completion and it was finally opened for traffic in 2018. This project suffered delay of over 3 years and estimated 116 crores of cost overruns. We thoroughly investigated this project to find out the reasons for cost and time overrun in this project. After in depth investigation we found the following factors were mostly responsible for cost and time overrun in this project

- 1) Escalation in costs
- 2) Changes in design during construction phase.
- 3) Increase in overhead cost due to increase in time.
- 4) Erroneous estimation during tendering.
- 5) Wastage of resources
- 6) Late in shifting utilities.
- 7) Inefficient Scheduling.
- 8) Lack of availability of materials in the construction zone.
- 9) Natural disasters (Rain, earthquake, flood 2014 etc.).
- 10) Lack of modern machinery
- 11) Congestion (inefficient transport facility to supply materials)
- 12) Security situation
- 13) Dependency on non-local labor

### 4.4 Srinagar City Ring road

This project was proposed for the development and benefit of people, therefore it is very important that these projects must be completed within stipulated time and budget. However in our part of the world we have developed a system even if the project is inaugurated by Prime minister the work is hardly started on time and these projects suffer cost and time overrun. The Srinagar city ring road project is one such project which was inaugurated by the prime minister of India in early 2018 to enhance the road network around the Srinagar city, which would help in the development of the region. The work on this project was started late by almost a

year. The experts say for any such project 90% of the land acquisition must be done before taking the project work which has not been the case with this project. There is a resistance on the owner's part over cost settlement. The cost of the land depends on the market trends which mean delay in land acquisition means the increase in cost of project. Thus is one thing that state govt. should strictly look into and address it. The delay in land acquisition has already escalated the cost by 13.50 crores. National Highways Authority of India (NHAI) is waiting for the response of government and any further delay will add to the cost of this project. After thorough investigations we found some other factors also that are cause of cost and time overrun in this project.

1. Escalation in costs
2. Changes in design during construction phase.
3. Increase in overhead cost due to increase in time
4. Erroneous estimation during tendering.
5. Wastage of resources
6. Late in shifting utilities.
7. Inefficient Scheduling
8. Lack of availability of materials in the construction zone.
9. Natural disasters (Rain, earthquake, etc.).
10. Public resistance.
11. Bad procurement schedule.
12. Land acquisition problems
13. Implementation of new technologies.
14. Subcontractors and nominated suppliers bad performance.
15. Delay in payment for completed works
16. Too much dependency on imported resources.
17. Repetitive changes in design and drawings.
18. Departmental/Institutional delays

Apart from these main projects many small projects were also taken into consideration, many pilot interviews were conducted with Government officials, contractors, clients, suppliers, labourer's etc. After an in depth literature review and thorough investigation in road construction projects in Kashmir a total of 37 significant factors were identified that are prime causes of cost and time overrun in road construction projects of Jammu and Kashmir

## IV. DATA ANALYSIS AND DISCUSSION

. The prime factors that trigger the cost and time overrun in road constructions projects in Jammu and Kashmir were found after a thorough literature review and In depth investigation of road construction projects. To verify these factors the questionnaire survey was carried out by distributing a total of 50 questionnaire sets. All questionnaires distributed were returned. The questionnaires were distributed to 15 clients, 25 contractors and 10 to consultant firms. We found that 1 of returned questionnaires was not complete and it was not considered for further data analysis. As a result, we have 49 sets of questionnaires usable for further analysis as presented in Table 1.



**Table 1: Summary of survey carried out**

Parameters	Values
No. of questionnaire distributed	50
No. of questionnaire received	50
No. of questionnaire were incomplete (Invalid)	1
No. of responses	49
Percentage of responses received (%)	98.00
Percentage of responses valid for analysis (%)	98.00

**5.3 Data Analysis**

To Rank the causes of cost and time overrun in road constructions projects in Jammu and Kashmir we have used the Relative importance index. The RII value was calculated for all major groups of the respondents, including the contractors, clients and consultants.

$$RII = \frac{\sum_{i=1}^5 w_i x_i}{A \times N}$$

Where:

RII – Relative Importance Index

i – Ranks from 1 to 5

w –Weighting given to each factor by the respondents and ranges from 1 to 5

x – Frequency of i-th response given for each cause

A – Highest weight (i.e. 5 in this case)

N – Total number of respondents.

**For factor: Delay in payments of completed works**

For general survey which includes all contractors, clients and consultants

Frequency of highest weight i.e rank 5 (Xi) = 40

Frequency of lowest weight i.e rank 1 (xi) = 0

Highest weight (A) = 5

Total number of respondents. (N) = 49

$$\Rightarrow RII = \frac{[(w_i x_i)]_i^5}{A \times N}$$

$$\Rightarrow RII = \frac{[(5 \times 40) - (1 \times 0)]}{5 \times 49}$$

$$\Rightarrow RII = \frac{[200]}{245}$$

$$\Rightarrow RII = 0.8163$$

Therefore RII for late payments for completed works is 0.816. Similarly we have calculated the RII for all the factors of overrun and the data of top 10 factors presented in table below

**Table 2 : Data calculation for all questionnaire responses**

S.No.	Factors of Overrun	frequencies of Highest rank (Xi)	RII
1	Land acquisition problems	44	0.90
2	Delay in payments of completed work	40	0.82
3	Delay in shifting of utilities	40	0.82
4	Security condition	39	0.80

5	Change in design during construction	38	0.78
6	Market inflation	37	0.76
7	Complicated terrains	37	0.76
8	Natural disasters	35	0.71
9	Institutional failure	33	0.67
10	Restrictions at work place	32	0.65

The above data shows us the rank of most significant factors that cause the cost and time overrun in road construction projects in Jammu and Kashmir. The most prevalent factors according to above calculations are Land acquisition problems, delay in payments for completed works, Delay in shifting utilities, and security conditions.

**Client responses**

There were 14 valid responses from clients as part of this investigative survey and the most important factors that cause cost and time overrun in road construction projects are presented in table 3.

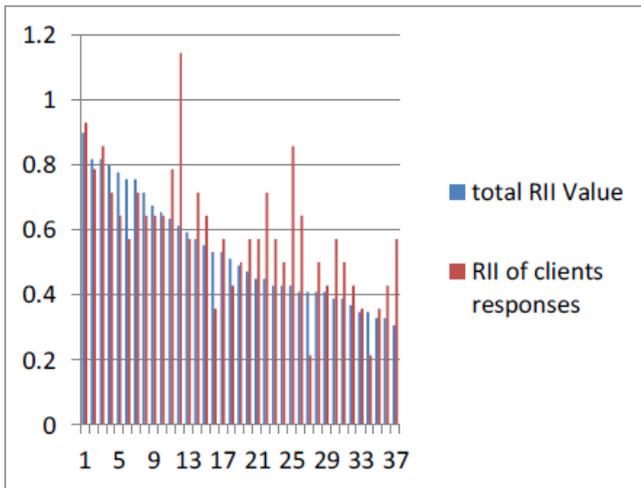
**Table 3 : Data calculation for client responses**

S no	Factors of Overrun	Frequency of client responses (Xi)	RII
1	Bad site management by contractors	14	1.00
2	Land acquisition problems	13	0.93
3	Delay in shifting of utilities	12	0.86
4	Mistakes during construction by contractors	12	0.86
5	Delay in payments of completed work	11	0.79
6	Lack of sub-contractor skills	11	0.79
7	Security condition	10	0.71
8	Complicated terrains	10	0.71
9	Low productivity of Equipment	10	0.71
10	Dependency on imported materials	10	0.71

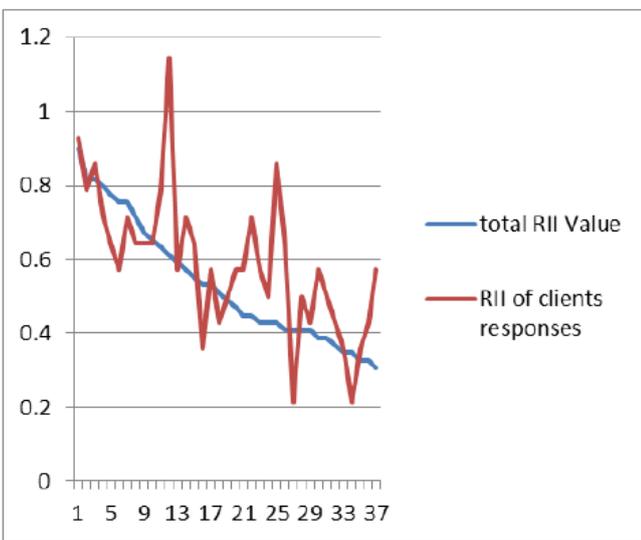
From above calculations it is evident that prime factors that cause cost and time overrun in road construction projects in Jammu and Kashmir are Land acquisitions, delay in payments for completed works, natural disasters, security conditions. The clients responses suggest that the most significant factors for overrun are same as that general responses suggest.



## Inquisition on Cost & Time Overrun in Road Construction Projects in Kashmir.



**Figure 1: Histogram showing comparison b/w total RII and RII of client responses**



**Figure 2 : Graph showing comparison b/w total RII and RII of client responses**

### Consultant responses

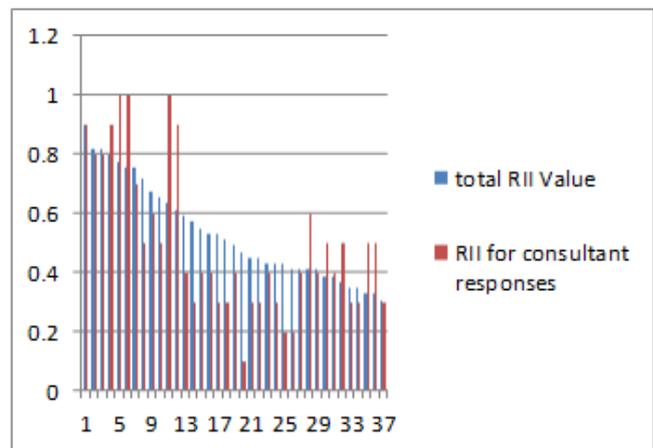
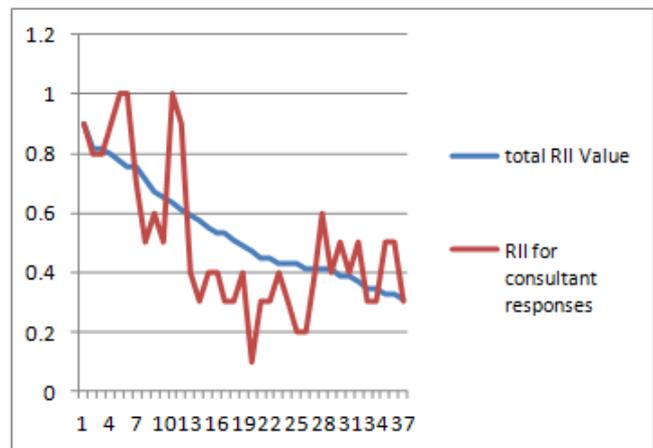
There were 10 consultants as part of this investigative survey and the most important factors that cause cost and time overrun in road construction projects are presented in table 4.

**Table 4: Data calculation for consultant responses**

S No.	Factors of Overrun	Frequency of consultant responses (Xi)	RII
1	Change in design during construction	10	1
2	Market inflation	10	1
3	Lack of sub-contractor skills	10	1
4	Land acquisition problems	9	0.9
5	Security condition	9	0.9
6	Bad site management by contractors	9	0.9

7	Delay in payments of completed work	8	0.8
8	Delay in shifting of utilities	8	0.8
9	Complicated terrains	7	0.7
10	Institutional failure	6	0.6

The data from above tables shows the most significant factors of cost and time overrun according to consultant responses. According to consultants the most important factors that cause cost and time overrun are change in designs during construction, market inflation, and lack of sub-contractor skills, land acquisition problems and security reasons. The consultants' response calculations shows that most significant cause is design changes and the second most significant cause is market inflation while as general data calculations keeps these two at 5<sup>th</sup> and 6<sup>th</sup> ranks respectively.



**Fig:3: Comparison between Total RII & consultant data RII**

### Contractor responses

There were 25 contractors as part of this investigative survey and the most important factors that cause cost and time overrun in road construction projects are presented in table 5.

Table 5: Data calculation for contractor’s response

S No.	Factors of overrun	Frequency of highest weight (Xi)	RII
1	Land acquisition problems	22	0.88
2	Delay in payments of completed work	21	0.84
3	Natural disasters	21	0.84
4	Delay in shifting of utilities	20	0.8
5	Security condition	20	0.8
6	Complicated terrains	20	0.8
7	Change in design during construction stage	19	0.76
8	Market inflation	19	0.76
9	Institutional delay	18	0.72
10	Restrictions at work place	18	0.72

The data calculation for contractors responses show that the point of view of contractors for the ranking of significant factors is almost same as the general perspective of all respondents barring a few factors which are ranked higher by contractors than the general perspective. The factors like natural disasters, restrictions at work place, and institutional failures are ranked higher by contractors. For other factors contractors are in agreement with general point of view of all respondents.

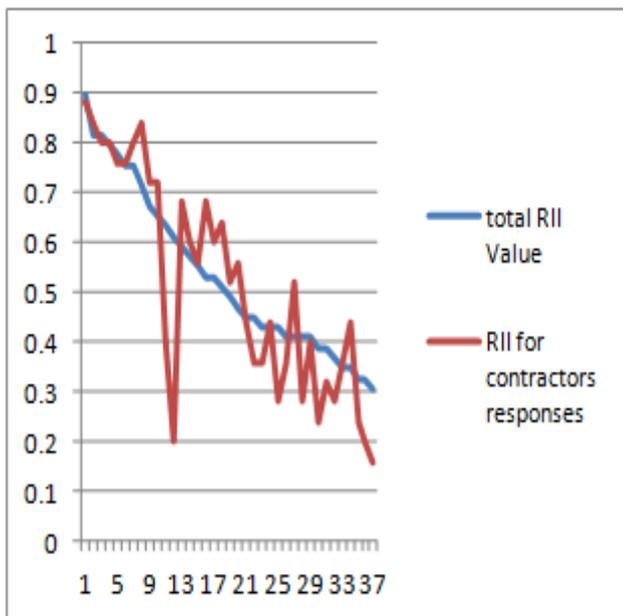
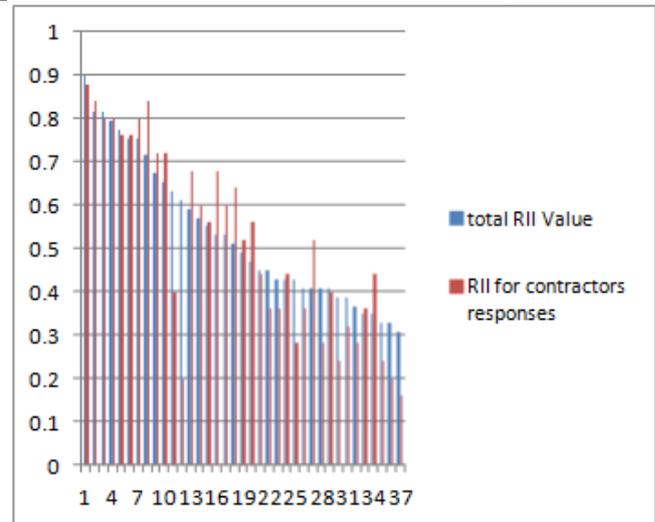


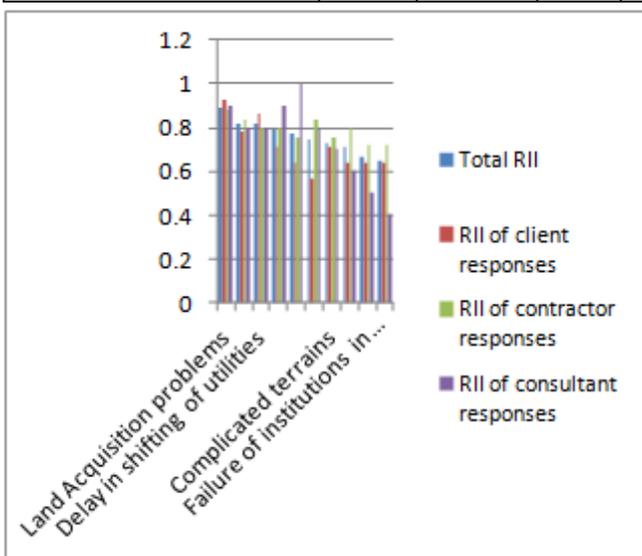
Figure 7 Graph for comparison of total RII and RII of contractor’s responses

5.4 Rankings of factors of overrun

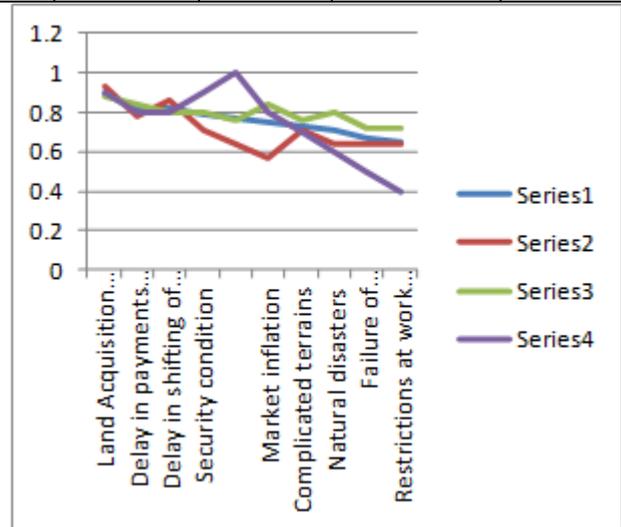
After all the data analysis and finding RII for different categories, the top 10 most significant factors that cause the cost and time overrun in road construction projects in Jammu and Kashmir. To Rank the causes of cost and time overrun in road constructions projects in Jammu and Kashmir We have used the Relative importance index. The RII value was calculated for each group of the respondents, including the contractors, clients and consultants. The top most significant causes of cost and time overrun in road construction projects which was ranked by the groups of respondents are presented in Table 6.

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Table :Rank comparison for different category responses								
Causes of cost overrun	Overall		Client		contractor		Consultant	
	RII	Rank	RII	Rank	RII	Rank	RII	Rank
Land Acquisition problems	0.89	1	0.93	1	0.88	1	0.90	2
Delay in payments for completed work	0.82	2	0.78	3	0.84	5	0.80	3
Delay in shifting of utilities	0.82	3	0.86	2	0.80	2	0.80	3
Security condition	0.79	4	0.71	4	0.80	8	0.90	2
Frequent changes in designs during construction	0.77	5	0.64	5	0.76	9	1.00	1
Market inflation	0.75	6	0.57	6	0.84	3	0.80	3
Complicated terrains	0.73	7	0.71	4	0.76	6	0.70	4
Natural disasters	0.71	8	0.64	5	0.80	4	0.60	5
Institutional delay in govt. projects	0.67	9	0.64	5	0.72	7	0.50	6
Restrictions at work place	0.65	10	0.64	5	0.72	7	0.40	7



**Figure 8 : Histogram for comparison of RII of different categories of respondents**



**Figure 8 : Graph for comparison of RII of different categories of respondents**

## V. CONCLUSIONS AND RECOMENDATOINS

### 6.1 Results & Conclusion

The results from this study indicates that the most significant causes of cost and time overrun are Land acquisition problems with a RII value of 0.89 and delays in payment for completed works by clients with a RII value of 0.82. This is followed by delay in shifting utilities, security, and changes in design during construction, market inflation, complicated terrains and natural disasters like floods and earth quakes. The result in Table 8 shows that the top 5 causes of cost overrun ranked by all three group of respondents are problems in land acquisitions, delay in payment of completed works by the client, difficulties in shifting the utilities by contractors and security. The following section is discusses these five main causes

**Land acquisition problems:** This is ranked as first major contributor of cost and time overrun with a RII value of 0.89. Land acquisition problems constitutes a serious threat to the Jammu and Kashmir road Construction Industry being able to improve because it has a serious effect on construction cost growth. This factor was ranked number 1 by the last study conducted in India on cost overruns by Rajakumar A C from Meenakshi Sundararajan Engineering College, Chennai. The RII calculated by him for this factor was 0.833. That proves this is common factor of overrun all over India. Many other studies have also ranked this factor very high.

**Delay in payment of completed works by the client:** This factor is ranked the 2<sup>nd</sup> most significant contributor of cost and time overrun with the RII value of 0.82. Delays in payments for completed works by clients are a critical factor which cause construction cost & time overruns not only in Kashmir, but can be one of the major causes of delays in most states, therefore, it is essential that clients should develop a responsive mechanism so as to speed up the payment process and issue the payments on time.

**Difficulties in shifting of utilities:** This is another major problem in contributing to cost and time overruns in Jammu and Kashmir road construction industry. This is the 3<sup>rd</sup> ranked factor with a RII value of 0.82 as agreed by all parties, including clients, contractors and consultants. Indeed, The smooth and early shifting of utilities by contractors play vital role in completing the project in accordance to planned schedule.

**Security:** This is the 4<sup>th</sup> ranked factor for cost and time overrun in road construction industry, all three group of respondents agreed that this factor is also a significant cause of cost overrun. This factor is ranked 4<sup>th</sup> with a RII value of 0.79. In Kashmir, security is a major concern that has prevented most projects from being completed on planned budget and time.

The 5<sup>th</sup> ranked factor is frequent changes in design documents with RII of 0.77, the consultants have ranked this factor as number one factor with RII of 1.0. This is indeed a major factor in areas where it is very difficult to execute the paper work on ground. The changes take time to execute and the already planned part gets wasted in numerous cases, which results in cost increase. The changes may also cause time overrun. Design must be drawn after the thorough surveying and testing only. This could prevent the frequent changes in design during construction.

### 6.2 Conclusion

In Kashmir, project cost & time overrun is a significant challenge for road construction industry. Through in-depth literature review fifty five causes of construction cost & time overrun were identified. A structured questionnaire survey was used to collect data in Kashmir. A total of 50 sets of questionnaires were distributed to selected clients, contractors and consultants, with 49 valid returns received and analyzed. A relative importance index method was employed to rank the causes of cost overrun. It was found that the most significant causes of cost & time overrun in road construction industry of Kashmir are Land acquisition problems, delay in payments for completed works by clients, difficulties in shifting the utilities by contractors, security, and Frequent changes in designs during construction by client. The findings call for urgent attention in improving the road construction industry of Jammu and Kashmir, which enhances its ability and performance to achieve improved cost performance and to mitigate against further project failure. This study found that natural disasters in recent years like 2014 floods also played a role in delaying these projects. we need to employ latest techniques of construction and management to prevent cost and time overrun in road construction projects in Kashmir.

### 6.3 Recommendations

We need to identify the lands to be acquired very early for land acquisition of the project. According to experts 80% of the land should be acquired before the work gets started, remaining 20% is acquired periodically after commencement of work. This is major reason for land acquisition problems. Government should form an efficient team that could set the land record right and help in acquiring land before the work starts.

Cost escalation is a realistic factor, it should be considered on project estimates. The best solution for cost escalation is early prediction based on future value of money in project estimates.

Natural disasters are unavoidable situations that can't be determined earlier. It may seem there are no solutions for that, but we can make provisions in contract of project about natural disasters. This will help in resolving the problem. The delay caused due to this factor should have a provision in the contract.

To avoid funding problems, we must provide a realistic time period in the contract for payments. This should clearly give an idea to parties when they have to pay. Clients must make a financial plan for disbursement and amount to be settled.

To prevent design changes during construction, An in depth review of design documents must be made. Designs must be drawn after complete surveys to prevent future changes. Early provisions must be kept for the unavoidable circumstances.

Shifting of utilities is an important factor, proper planning must be done before taking the project. Authorities must identify the scope of relocation and shifting plan must be implemented to avoid this issue. This issue can be avoided by forming a committee with members from all departments who will manage the shifting of utilities.

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Wrong estimations during bidding process is also a factor for overrun. This can be prevented by taking sufficient time to prepare tender documents and work out all possibilities carefully. This can prevent the cost overrun in later stages. On the bases of reconnaissance survey detailed workout of materials should be carried out to avoid this issue.

Non availability of materials can be prevented by maintaining an inventory of rare materials. These materials should be purchased before the start of work, so that the work must not stop due materials unavailability. This issue can be easily prevented by making a proper procurement schedule.



**Manish Kaushal**, received his B-Tech degree in civil engineering in 2011 from Pujab Technical University, Jalandhar, M-Tech from Punjab Technical University, Jalandhar in 2015. Presently, he is working as Assistant Professor in Department of Civil Engineering RIMT University, Punjab, India.

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### AUTHORS PROFILE



**Amir Bashir**, Masters of Technology  
Rimt University  
**Bachelors of technology**  
Dr APJ Abdul Kalam Technical University



**Dr Sandeep Singla**, PHD Scholar , Presently he is working as professor and Head of Department Civil engineering RIMT University Punjab India .  
Published more than 60 papers in national and international journals/conferences.  
Member of ISTE and a life member of IEL.

[drsandeepsinglaz@gmail.com](mailto:drsandeepsinglaz@gmail.com)  
+918872002097

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