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A Study on Causes and Impacts of Disputes on Selected Road Construction Contracts under Department of Roads, Nepal

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Abstract. Construction projects, particularly road projects, are highly susceptible to disputes, leading to significant negative consequences. This research aimed to categorize road project disputes by severity, identify their root causes, analyze their impacts on contracts, and explore mitigation strategies. Data were collected through questionnaires distributed to 112 respondents, with an 82.14% response rate, and analyzed to determine major dispute causes, their effects, and potential solutions. Spearman's rank correlation was used to assess stakeholder (employer, consultant, contractor) perceptions. The study revealed that disputes primarily arise from land acquisition challenges, forest clearing delays, resettlement issues, mismanagement of contract terms, and fluctuations in labor, material, and equipment costs. These disputes severely impact road contracts, causing project delays, cost overruns, strained stakeholder relationships, reputational damage, and even project failure. To minimize such disputes, the study emphasizes fostering a trustworthy project environment, ensuring timely issue resolution, approving and delivering drawings promptly, and meeting other critical requirements. Proactive measures, such as clear contract documentation, effective communication, and stakeholder collaboration, are essential to reducing claims and disputes in future road projects. By addressing these key factors, construction stakeholders can enhance project efficiency, maintain harmonious relationships, and safeguard public image while ensuring successful project delivery. The findings underscore the importance of dispute prevention strategies to mitigate risks and improve overall project outcomes in the road construction sector.

Keywords: Road Projects, Contract, Disputes, Causes, Impacts, Minimization Measures.

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1. Introduction

The construction industry is inherently complex and prone to disputes, even among well-intentioned parties. Such disagreements often escalate into costly conflicts that negatively impact project budgets, timelines, and resource allocation. Nepal's rapidly expanding construction sector faces significant challenges, particularly in road infrastructure projects funded by agencies such as the Asian Development Bank (ADB) and the World Bank (WB). Several studies indicate that a significant proportion of road infrastructure projects in Nepal face disputes, resulting in delays, increased costs, and legal challenges despite growing investment in the sector. Disputes in construction projects arise from multiple factors, including delays in land acquisition, contractual ambiguities, and fluctuating costs. Several international reports focusing on construction disputes in various regions identify poor contract administration, design errors, and external factors such as adverse weather and regulatory changes as primary causes of dispute [1].

In the Nepalese context, disputes frequently originate from resettlement issues, utility relocations, and unrealistic contract terms, which further exacerbate project delays and cost overruns [2]. Additionally, common dispute types in construction projects include variations (adjustments), unforeseen site conditions, and delay [3]. The consequences of these disputes are severe, extending beyond direct financial losses to include strained stakeholder relationships, reputational damage, and even project failure. A study of seven road projects under Nepal's Department of Roads (DoR) found that approximately NRs 2.15 million was spent on Alternative Dispute Resolution (ADR), significantly higher than the typical cost of around NRs 370,000 [4]. This figure excludes intangible losses such as missed business opportunities, reduced workforce motivation, and property damage. Disputes have been identified as contributing factors to budget overruns, schedule delays, reduced productivity, quality deterioration, resource wastage, poor decision-making, increased costs, and elevated stress levels [4].

Effective dispute resolution mechanisms are therefore critical to mitigating these impacts. Nepal currently employs methods such as mutual negotiation, mediation, Dispute Resolution Boards (DRBs), and arbitration through the Nepal Council of Arbitration (NEPCA) [2]. However, several studies and reports reveal systemic inefficiencies, exemplified by prolonged disputes in infrastructure projects like the Pathlaiya-Birgunj road widening and the Narayanghat-Muglin improvement projects, underscoring the need for improvement in dispute resolution practices. Addressing these challenges requires proactive measures, including the development of clearer contractual terms, prompt decision-making, and enhanced collaboration among stakeholders. This study investigates the causes, impacts, and recommends mitigation measures for disputes in Nepal's road construction projects. Drawing on the perspectives of employers, contractors, and consultants, it identifies key dispute drivers and assesses their implications for cost and schedule performance. The findings are intended to inform more effective dispute prevention and resolution strategies, thereby enhancing project execution efficiency and minimizing financial losses.

2. Theory and Methods

This study utilized both primary and secondary data, incorporating quantitative and qualitative approaches to ensure comprehensive analysis. Primary data was collected through structured questionnaires and Key Informant Interviews (KIIs) to capture stakeholder

perceptions on construction disputes, their causes, impacts, and mitigation measures in Nepalese road projects. Respondents—including employers, consultants, and contractors—rated dispute-related factors on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). Additionally, KIIs were conducted with arbitrators and road construction specialists to gather expert insights. Secondary data was sourced from legal dispute records of the Department of Roads (DoR), government reports (e.g., Public Procurement Monitoring Office, NEPCA), academic research, and policy documents. The study employed quantitative methods (Relative Importance Index, Spearman's rank correlation) to analyze survey data, while qualitative insights were derived from interviews. For analysis, nine road contracts under the Department of Roads (DoR), in which disputes arose and were registered in NEPCA for resolution during the fiscal year 2076/77, were selected to ensure targeted relevance to Nepal's road construction sector. The details of these contracts are as follows:

- Ghorahi-Holeri Section of Sahid Marg (Ghorahi-Ghartigaun)
  Contract No: RIP/337133/SM-02/2070-071
- Halesi–Diktel Road Contract No: SCRP/NCB/HD/02
- Narayanghat-Muglin Road
  Contract No: NIRTTP-DOR-W-ICB-2
- Black-topped Road (DBSD) at Hatiya-Burtibang Sector
  Contract No: MHHP/3371384/070-71/031
- Chandranigahpur–Gaur Road Project
  Contract No: RIP/EXIM/CG-07
- Dhading-Gorkha Road, Ghyampesal-Gorkha Section
  Contract No: EEAP/NCB/DG/03
- Rani–Biratnagar–Itahari–Dharan Road sector
  Contract No: TRIP/337312/RBID/071-72/01
- RCC Bridge Over Ghatte Khola
  Contract No: 58/067/068-650
- RCC Bridge for Dhankaul, along Naya Road Madhuwani Road, Sarlahi
  Contract No: HRP/3372244/071-72/BC-005

2.1. **Relative Importance Index (RII).** The relative importance of the causes, impacts, and minimization strategies of disputes in construction was obtained using the Relative Importance Index (RII). The respondents' scores were aggregated to determine the overall score for each factor. The RII was calculated using the following formula [5]:

$$\text{RII} = \frac{\sum W}{A \times N} = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{5N} \tag{1}$$

where:

- W = weighting given to each variable by the respondent (ranging from 1 to 5),
- n_1 = number of respondents for Strongly Disagree,
- n_2 = number of respondents for Disagree,
- n_3 = number of respondents for Neutral,
- n_4 = number of respondents for Agree,
- n_5 = number of respondents for Strongly Agree,
- A = highest weight (i.e., 5),
- N = total number of responses.

The RII ranges from 0 to 1 [6].

2.2. **Spearman's Rank Correlation.** Spearman's correlation coefficient (ρ) is a statistical measure of the strength and direction of association between two ranked variables [7]. It evaluates how well the relationship between two variables can be described using a monotonic function. The coefficient is bounded by $-1 \leq \rho \leq 1$. The formula is:

$$\rho = 1 - \frac{6 \sum d^2}{n(n^2 - 1)} \tag{2}$$

where:

- d = difference between the ranks of paired data,
- n = number of observations.

The interpretation of ρ is based on the strength of correlation:

- -1 = perfect negative correlation,
- 0 = no correlation,
- 0 to 0.19 = very weak,
- 0.20 to 0.39 = weak,
- 0.40 to 0.59 = moderate,
- 0.60 to 0.79 = strong,
- 0.80 to 1.00 = very strong,
- +1 = perfect positive correlation.

3. Results and Discussion

The findings of the study, derived from the analysis of nine selected road contracts and the responses collected through a structured research questionnaire, are presented in this section. The data provide insights into factors causing disputes and their impacts within Nepal's road construction sector.

3.1. **Qualitative Approach.** Based on a detailed case study of selected road contracts, Table 1 summarizes the primary causes and impacts of disputes that arose during the construction phase. The review identified that the most common causes were related to price adjustments and delays in the approval of extensions of time (EOT). Other notable factors included unresolved variation claims, unjust imposition of liquidated damages, delays in land acquisition, and perceived ill intent by the employer. These disputes resulted in increased project costs, schedule overruns, and cash flow difficulties for contractors. Additional consequences included rising administrative and legal expenses due to arbitration or litigation. Furthermore, the conflicts led to deteriorating relationships between employers and contractors, loss of trust, reputational damage to contractors, and adverse ripple effects on various project stakeholders—highlighting the need for better contract management and timely dispute resolution.

3.2. **Quantitative Approach.** The quantitative approach employed in this study involved the collection and systematic analysis of numerical data to assess the relative importance of various factors contributing to construction disputes. A structured questionnaire, developed based on an extensive literature review, was administered to professionals involved in nine selected road construction projects. Respondents included representatives from employers, contractors, and consultants. The questionnaire was distributed via hard copies and Google Forms. A total of 112 questionnaires were sent to stakeholders (45 employers, 32 consultants, and 35 contractors), yielding 92 responses (40, 27, and 25, respectively). The distribution of responses is illustrated in Figure 1.

TABLE 1. Summary of Dispute Causes and Impacts in Selected Road Projects

SN	Project	Contract No.	Causes of Disputes	Impacts of Disputes
1	Ghorahi-Holeri Section of Sahid Marg (Ghorahi-Ghartigaun)	RIP/337133/SM-02/2070-071	Delay in payments of IPC, variation issue, delay in approval of Extension of Time (EOT)	Increased contract price, overall project cost, and delay in project completion time.
2	Halesi – Diktel Road	SCRP/NCB/HD/02	Wrongful deduction of liquidated damage, claim for extended overhead	Additional managerial and administrative costs, increased overall project cost.
3	Narayanghat-Muglin Road	NIRTTP-DOR-W-ICB-2	Land acquisition issues, delay in payments, force majeure events (flood, earthquake), price adjustment on prolongation	Increased project cost, deterioration of employer-contractor relationship.
4	Black-topped Road (DBSD) at Hatiya-Burtibang Sector	MHHP/3371384/070-71/031	Price adjustment issues, delay in IPC payments, delay in EOT approval	Extra arbitration expenses, increased cost, delay in completion.
5	Chandranigahpur – Gaur Road Project	RIP/EXIM/CG-07	Price fluctuation of materials, labor and equipment; price adjustment issues, delayed payment	Increased project cost, strained relationships.
6	Dhading-Gorkha Road, Ghyampesal-Gorkha Section	EEAP/NCB/DG/03	Price adjustment, insurance payment issues, extra claims for equipment/materials, liquidated damages	Negative ripple effect, damaged contractor reputation.
7	Rani – Biratnagar – Itahari – Dharan Road Sector	TRIP/337312/RBID/071-72/01	Price adjustment issues, delay in EOT approval	Legal charges, increased costs, delay in completion.
8	RCC Bridge Over Ghatte Khola	58/067/068-650	Price adjustment issues, delay in EOT approval	Negative impact on stakeholders, reduced mutual respect.
9	RCC Bridge for Dhankaul, Naya Road, Madhuwani Road, Sarlahi	HRP/3372244/071-72/BC-005	Poor contract implementation, contract termination, price adjustment issues, employer's malintent	Damaged relationships, increased cost, delays, contractor cash flow problems.

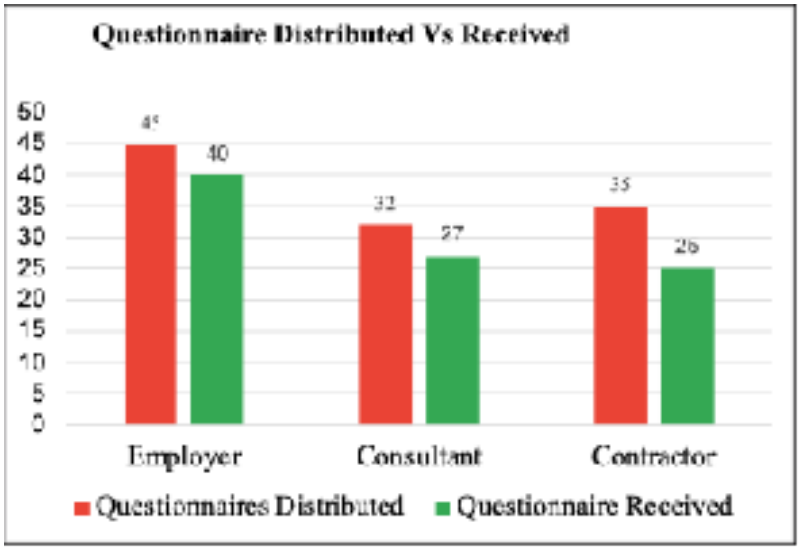

FIGURE 1. Questionnaire Distributed vs Received.

The data collected from the questionnaire survey were analyzed based on respondents' ratings, and the Relative Importance Index (RII) for each dispute-causing factor was calculated using Microsoft Excel. The identified factors were categorized into four thematic groups. Among all the factors, only the top five with the highest RII values are presented in the tables below, highlighting the most critical contributors to disputes in the studied construction projects.

3.3. **Thematic Analysis of Dispute Causes Across Stakeholder Perspectives.**

3.3.1. *Employer-related Dispute Factors.* The analysis of dispute causes revealed both consensus and divergence among stakeholders, as shown in Table 2. All groups identified delay in the approval of extensions of time (EOT) as the most critical employer-related factor, with a combined RII of 0.863. Similarly, land acquisition issues were consistently ranked second most critical (combined RII = 0.835) across all groups, confirming earlier findings [8, 9], who emphasized the impact of unresolved pre-construction challenges on dispute occurrence. However, a notable variation was observed in the perception of payment delays, where contractors assigned greater importance (RII = 0.808) than employers (RII = 0.780), reflecting differing financial priorities consistent with the observations of article [5]. Despite these differences, Spearman's rank correlation analysis demonstrated a strong overall agreement among stakeholders, as reflected in the results presented in Table 2.

TABLE 2. Employer-related dispute factors

Factors	Employer (RII)	Consultant (RII)	Contractor (RII)	Combined (RII)	Overall Rank
Delay in approval of extension of time (EOT)	0.840	0.896	0.864	0.863	1
Issue of land acquisition	0.810	0.867	0.840	0.835	2
Variation orders issue	0.735	0.815	0.789	0.813	3
Untimely delivery of design drawings	0.805	0.800	0.800	0.750	4
Payment delays	0.780	0.851	0.808	0.685	5

TABLE 3. Spearman's ρ for employer-related factors

Stakeholder Pair	ρ	p-value	Strength
Employer-Consultant	0.82	<0.001	very strong
Employer-Contractor	0.68	0.002	strong
Consultant-Contractor	0.84	<0.001	very strong

3.3.2. *Contractor-related Dispute Factors.* Contractor-related causes showed more variation between stakeholders, as presented in Table 4. While employers and contractors agreed that slow progress of work was the most problematic factor (RII = 0.860 and 0.808, respectively), consultants ranked poor quality work as the highest concern (RII = 0.867) [**?**].

TABLE 4. Contractor-related dispute factors

Factors	Employer (RII)	Consultant (RII)	Contractor (RII)	Combined (RII)	Overall Rank
Slow progress of work	0.860	0.852	0.808	0.841	1
Poor planning and management	0.769	0.844	0.733	0.826	2
Poor quality of work	0.840	0.867	0.748	0.817	3
Overcommitment	0.805	0.800	0.826	0.757	4
Contractor's financial problem	0.780	0.785	0.817	0.748	5

TABLE 5. Spearman's ρ for contractor-related factors

Stakeholder Pair	ρ	p-value	Strength
Employer-Consultant	0.78	<0.001	strong
Employer-Contractor	0.62	<0.001	moderate
Consultant-Contractor	0.58	<0.001	moderate

The Spearman's rank correlation results (Table 5) indicate a strong agreement between employers and consultants ($\rho = 0.78$), suggesting a high level of alignment in their perceptions of dispute factors. In contrast, the correlations between employers and contractors ($\rho = 0.62$) and between consultants and contractors ($\rho = 0.58$) were moderate, implying some differences in priorities and perspectives between these stakeholder groups.

3.3.3. *Contract-related Dispute Factors.* Contract-related issues consistently emerge as primary dispute drivers across all stakeholder groups. The data reveals particularly strong consensus regarding poor contract implementation as the most significant factor (combined RII = 0.859), with consultants expressing the highest concern (RII = 0.881). This suggests systemic challenges in applying contract terms consistently throughout project execution [9, 5].

TABLE 6. Contract-related dispute factors

Factors	Employer (RII)	Consultant (RII)	Contractor (RII)	Combined (RII)	Overall Rank
Poor contract implementation	0.835	0.881	0.872	0.859	1
Price fluctuation of construction materials, labor, etc.	0.880	0.770	0.864	0.843	2
Contract ambiguities	0.825	0.778	0.784	0.800	3
Price adjustment clause	0.785	0.741	0.752	0.763	4
Force majeure clause	0.690	0.748	0.800	0.737	5

TABLE 7. Spearman's ρ for contract-related factors

Stakeholder Pair	ρ	p-value	Strength
Employer-Consultant	0.85	<0.001	very strong
Employer-Contractor	0.77	<0.001	strong
Consultant-Contractor	0.88	<0.001	very strong

The high correlation coefficients ($\rho > 0.77$) with statistically significant p-values (< 0.001) indicate remarkable consistency in how different stakeholders prioritize contract-related problems. However, the slightly lower employer-contractor alignment ($\rho = 0.77$) reflects differing perspectives on risk allocation — employers often favor rigid terms while contractors emphasize flexibility for unforeseen conditions.

3.3.4. *Common Issues in Both Parties Causing Disputes.* Common issues represent shared problems that transcend traditional employer-contractor boundaries. The data shows remarkable consistency across stakeholders regarding lack of coordination and trust as the top concern (combined RII = 0.867), with consultants particularly emphasizing carelessness in dispute resolution (RII = 0.941). These interpersonal and systemic factors often amplify technical contract issues [8, 9, 10].

TABLE 8. Common issues causing disputes

Factors	Employer (RII)	Consultant (RII)	Contractor (RII)	Combined (RII)	Overall Rank
Lack of coordination/trust, etc.	0.850	0.881	0.880	0.867	1
Carelessness in dispute resolution	0.830	0.941	0.840	0.861	2
Late material supply	0.600	0.807	0.792	0.843	3
Issue of delay payment	0.820	0.837	0.846	0.822	4
Personal ego	0.800	0.719	0.688	0.695	5

TABLE 9. Spearman's ρ for common issues

Stakeholder Pair	ρ	p-value	Strength
Employer-Consultant	0.81	<0.001	very strong
Employer-Contractor	0.73	<0.001	strong
Consultant-Contractor	0.86	<0.001	very strong

The correlation analysis reveals particularly strong consultant-contractor alignment ($\rho = 0.86$) on common issues, suggesting field personnel share similar frustrations about collaboration challenges. The slightly lower employer-contractor correlation ($\rho = 0.73$) may reflect differing priorities between management and execution teams.

3.4. **Impacts of Disputes.** Table 10 summarizes the combined stakeholder assessment of dispute impacts, with project delays (RII = 0.933) and cost overruns (RII = 0.898) ranking as the most severe. Administrative burdens (RII = 0.865) and project failure risks (RII = 0.796) follow as significant secondary effects, while quality compromises (RII = 0.765) and reputational damage (RII = 0.722) emerge as persistent long-term concerns. This hierarchy reveals that, while immediate financial and schedule impacts dominate stakeholder perceptions, relational and operational consequences also substantially influence project outcomes. The consensus across employer, contractor, and consultant groups underscores the need for holistic dispute mitigation addressing both economic and collaborative dimensions of construction projects [8, 9, 10].

TABLE 10. Impacts of Disputes

Impacts of Disputes	**RII**	**Rank**
Delayed in project completion time	0.933	1
Increased Overall Project Cost	0.898	2
Additional expenses in management and administration of contract	0.865	3
Project Failure	0.796	4
Delay in getting benefit from project	0.795	5
High Arbitration and Litigation Cost	0.783	6
Low Quality of work	0.765	7
Poor site Safety	0.733	8
Loss of company/organization reputation	0.722	9
Deterioration of relationship between stakeholders (Employer, Contractor, Consultant)	0.698	10

3.5. **Proposed Strategies for Disputes Minimization.** Key Informant Interviews (KII) with experienced practitioners, including arbitrators and road construction specialists, identified several strategies for minimizing disputes in construction projects. Foremost among these was the timely issuance, approval, and delivery of drawings and other essential project requirements, as delays in these processes have been consistently cited as a major dispute trigger [11, 2]. Respondents also stressed that contracts should be awarded only after resolving land acquisition and socio-environmental issues, in line with the findings of articles [8, 9]. Regular progress meetings were recommended to address emerging issues before they escalate, a measure supported by previous studies highlighting proactive communication as an effective dispute prevention tool [3, 10]. Budget assurance and the establishment of a clear payment schedule prior to contract execution were emphasized as critical to preventing payment-related disputes, aligning with contractor-focused research from [5]. In addition, fostering teamwork and building a culture of trust among stakeholders were seen as essential, echoing [12] observations on collaborative practices in hydropower projects. Other recommended measures included the mandatory appointment of a contract manager or dispute manager in large-scale road projects, robust documentation practices [13], thorough site investigations prior to tendering, and the inclusion of explicit contract clauses relating to scheduling and time extensions. Together, these measures address both preventive and procedural dimensions of dispute management, targeting root causes while strengthening resolution mechanisms during road project execution.

4. Conclusion

The study identified delays in approving extensions of time (EOT) and land acquisition issues as the most significant drivers of construction disputes, with a strong consensus

among stakeholders. Payment delays were considered less critical overall, though contractors rated them higher, reflecting different financial priorities. Employers and consultants showed strong agreement in their views, while contractors' perspectives differed moderately. These disputes typically lead to project delays, cost escalations, and damaged stakeholder relationships, ultimately impacting project performance. To address these challenges, the study recommends both preventive and procedural measures, including early resolution of land and socio-environmental issues, timely delivery of design documents, securing budget availability, regular coordination meetings, appointment of dedicated dispute or contract managers, rigorous documentation, thorough site investigations before tendering, and clear contractual provisions on scheduling and time extensions. Together, these strategies aim to reduce conflicts, strengthen collaboration, and support successful project delivery in the road construction sector.

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