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Construction Claim Types and Causes for a Large-Scale Hydropower Project in Bhutan

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Abstract: Hydropower construction projects are complex and uncertain, have long gestational periods and involve several parties. Furthermore, they require the integration of different components (Civil, Mechanical and Electrical) to work together as a single unit. These projects require highly specialised designs, detailed plans and specifications, high-risk construction methods, effective management, skilful supervision and close coordination. Thus, claims are common in such projects. These claims are undesirable because they require significant time and resources to resolve and cause adversarial relationships among the parties involved. Therefore, it is in the common interest of all involved parties to prevent, minimise, or resolve claims as amicably as possible. Identifying common claim types and their causes is essential in devising techniques to minimise and avoid them in future projects. This report details a case study performed on a large-scale hydropower project in Bhutan. The findings of this case study indicate that differing site conditions are the major contributor of impact and change claims and 95% of total claims can be settled by negotiation, whereas 5% of claims can be settled by arbitration.

Keywords: Hydropower projects, Construction claims, Claim types, Claim causes, Claim frequency, Claim severity

INTRODUCTION

Claims are the primary source of problems in the construction industry. Construction claims are considered by numerous project participants to be one of the most disruptive and unpleasant events of a project (Ho and Liu, 2004). Most construction projects are uncertain and complex, involve a wide variety of business parties, extend over a lengthy period of time and require highly specialised designs, detailed plans and specifications, high-risk construction methods, effective management, skilful supervision and close coordination. Large hydropower construction projects are extremely complex and consist of several inter-related activities/work packages of different disciplines involving numerous parties. Thus, claims are common in such projects, further delaying completion times and causing cost overruns. Moreover, construction contracts are extremely long, complex sets of documents, which are often not well understood by the parties and lead to differing interpretations by different parties. Consequently, disagreements or disputes arise regarding contractual obligations or expectations. Minimising and avoiding construction claims and disputes requires understanding the contractual terms and clauses early on while identifying and understanding the causes of the claims. When one party believes that the other party has not met the contractual obligations or expectations and that they deserve monetary and/or time compensation, they may submit a claim. A survey performed in western Canada discovered that a large majority of claims involved delays, and,

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in several cases, these delays exceeded the original contract duration by over 100%. Additionally, more than half of these claims resulted in additional costs of at least 30% of the original contract values (Semple, Hartman and Jergeas, 1994).

According to Detlev (2004), the increase in claims and disputes has multiplied over the past decade. It is evident that certain factors influencing the serious and substantial increase in the number of claims for additional compensation are due to the complexity of the projects now being undertaken and the price structure of the industry, which does not permit the absorption of unanticipated additional costs by the contractor. As such, in recent years, the participants in the construction process have become increasingly concerned regarding construction claims.

The goal of this study is to identify various monetary claim types and claim causes that have occurred during the construction of this project and rank them according to the frequency of occurrence and severity of the claim amount. Additionally, the modes of claim settlement and the duration of the claims are analysed.

BHUTAN'S HYDROPOWER RESOURCES AND DEVELOPMENT

The Kingdom of Bhutan is a small landlocked country located in the eastern Himalayas that covers an area of 38,394 square kilometres and roughly measures 140 km north to south and 275 km east to west. It shares a boundary in the south, east and west with India and borders China to the north. Over 72% of its land is under vegetative cover, with altitudes varying from 100 meters above sea level (MASL) in the southern sub-tropical region to 7,550 MASL in the northern alpine region. Most of the mountainous regions of the north remain under snow cover throughout the year, which provides perennial water flow in its rivers. The rivers of Bhutan carry large flows during the monsoon season and snow-fed flows in the winter. Thus, the combination of Bhutan's hydrology and topography creates a large potential for harnessing hydropower.

Bhutan has an estimated hydropower potential of 30,000 MW and 120 TWh mean annual energy generation, which indicates an average development potential of 781 kW per square kilometre of land (catchment). Based on the updated Power System Master Plan (PSMP) Report (Department of Energy, Royal Government of Bhutan, 2004), 23,760 MW from 76 sites with capacities at or above 10 MW have been identified and assessed to be technically feasible. Most of the schemes identified are run-of-the-river types, which are low cost and environmentally friendly. Furthermore, a few areas with acceptable environmental impacts have been identified in the southern belt before the Bhutanese rivers flow out and enter the Indian plains (Tshering and Tamang, 2004).

Hydropower is the backbone of the Bhutanese economy and a key contributor to the development of the country. The correlation between hydropower development and the country's economic growth is striking. According to the National Statistical Bureau (NSB), Bhutan experienced one of the highest gross domestic product (GDP) growth rates of 21.4% in 2007, compared with 6.3% in 2006, primarily due to the completion of the Tala Hydro Power Project, which substantially increased the electricity sector's contribution to the total GDP. More than 75% of the power is exported to India. Electricity from hydropower is the highest contributor to the government exchequer and will remain so in the future. In 2006, hydropower's share of the country's total GDP was 14% with earnings of BTN 5,582 million (exchange rate USD 1 = BTN 42).

Despite hydropower's high potential, it is estimated that only 5% of its total capacity has been harnessed to date. Given the importance of hydropower to the economy for achieving national development objectives, the government has placed a high priority on the expansion of this sector, with goals to harness and export 10,000 MW of hydropower by the year 2020. Thus, significant emphasis has been placed on the construction of hydropower in Bhutan. The Punatsngchhu-I (1200 MW) and Dagachhu (114 MW) hydropower projects are already under construction, the Punatsangchu-II and Mangdechu projects are expected to begin construction by early 2010 and studies are being performed on numerous other projects. It has been estimated that approximately BTN 442 billion (USD ~9.60 billion) will be invested to generate approximately 10,406 MW by the year 2020 (Druk Green Power Corporation Ltd., 2009). Table 1 lists a few important projects that will be developed within the next 20 years.

To fulfil the government's target of 10,000 MW by the year 2020, projects such as the Sunkush Reservoir (4000 MW), Kuri Gangri (1800 MW) and Amochu (620 MW) have been added to this list and their construction schedules are being revised to accelerate progress.

Table 1. Large Projects Scheduled for Development in the Next 20 Years (PSMP 2002–2020)

River Basin	Name of Project	Gross Head (meters)	Installed Capacity (MW)	Mean Annual Energy (GWh)	Proposed Construction Period
Punatsangchhu	Punatsangchhu-I	286	1,000	4,770	2007–2012
Mangdechhu	Mangdechhu HPP	719	670	2,909	2009–2014
Punatsangchhu	Punatsangchhu-II	267	990	4,667	2012–2017
Bumthangchhu	Zhemgang/Digala	527	670	3,207	2015–2020
Bumthangchhu	Kheng/Shingkhar	487	570	2,713	2017–2022
Drangmechhu	Kholongchhu (Gomkora)	378	485	2,209	2020–2025
Total	6 projects		4,385	20,475	

India has been the lead donor in providing both technical and financial assistance to numerous hydropower projects in Bhutan. This relationship has been a win-win situation for both countries because India has a large power demand while Bhutan has a large hydropower potential. However, to accelerate development and achieve the goal of 10,000 MW by the year 2020, the government is in the process of implementing a Foreign Direct Investment (FDI) policy for hydropower development in Bhutan, which would encourage foreign investors.

Thus, given the expected hydropower construction boom within the next few years, it is vital that project participants be prepared to perform their work successfully. Claims in construction are a contentious issue and the success of the projects depends on how well the claims can be prevented, minimised and managed. Despite a history of large cost overruns, completion delays and numerous claim issues in Bhutan, there has been no study performed on these issues to date. Therefore, the goal of this study is to determine the key types of claims and various causes as well as the method in which these claims were settled in recently completed large hydropower projects in Bhutan.

CONSTRUCTION CLAIMS: TYPES AND CAUSES

Bramble, D'Onofrio and Stetson (1990) grouped claims under four types: change claims, impact claims, performance quality claims and bad faith claims. Change claims included formal/directed changes, constructive changes, cardinal changes, changes due to differing site conditions and design related changes. Impact claims were related to claims from delays, disruptions and acceleration. A study performed by Zaneldin (2006) in the UAE discovered that claim types in construction projects could be classified into six main types: contract ambiguity claims, delay claims, acceleration claims, change claims, extra work claims and differing site condition claims. A survey conducted in Portugal by Moura and Teixeira (2007) found 10 different types of claims: direct changes, errors and omissions, indirect changes, delays, acceleration, force majeure, beginning and ending, measurement and payment, suspension of work and termination of contract.

One of the best methods to devise measures to avoid or minimise these claims is to determine the primary sources or causes of the claims. In hydropower projects, there are several varied sources of claims, thus making it critical that we identify their exact causes. Al-Khalil and Al-Ghafly (1999) identified various important causes of delay claims in public utility projects in Saudi Arabia based on the severity and frequency of occurrence. Zaneldin (2006) identified 26 different causes of claims in construction projects in the UAE: change or variation orders, delay caused by owner, oral change orders by owner, delay in payments by owner, low price of contract due to high competition, changes in material and labour costs, owner personality, variations in quantities, subcontracting problems, delay caused by contractor, contractor not well organised, contractor financial problems, bad quality of contractor's work, government regulations, estimating errors, scheduling errors, design errors or omissions, execution errors, bad communication between parties, subsurface problems, specifications and drawings inconsistencies, termination of work, poorly written contracts, suspension of work, accidents and planning errors. The important causes of claims related to the contract are as follows: ambiguous contract, conflicting information, omissions of provisions, adjustment of clauses, multiple contracts, inadequate bid information, frequent changes in plans and specifications and inadequate bid preparation time for bidders etc. According to Hassanein and Nemr (2008), the most common types of claims have been documented as change orders and delays caused by the owner. The contractor actions that lead to claims are as follows: inadequate investigation before bidding, underbidding and poor planning and management. At the International Conclave on Contract Management for Accelerated Development of Indian Hydropower Projects held in Delhi on 2007, it was determined that the primary causes of claims in hydropower projects included long gestation periods, hydro-geological surprises, subsurface conditions, delays in getting approvals, contractual problems and changes in work.

RESEARCH METHODOLOGY

Considering the various claim types and causes of claims identified by the literature review, research was performed on a case study with a single-embedded design (Yin, 1994) to determine the important claim types and causes that occurred during the construction of a hydropower project in Bhutan. The hydropower project has a capacity of 1,020 MW with a project cost of USD 300 million and a final completion cost of USD 400 million. Commissioning of the project was planned for June 2005 but was delayed until March 2007 because of geological problems.

The site was visited and data were gathered by referring to several claim documents, contract documents, archival records, minutes of meetings (MoMs), correspondences, project daily reports, technical specifications, claims working sheets, progress reports, damage and delay/disruption reports, photographs and various other supporting archival records.

The claims documents and archival records were studied to create a database for the case. Evidence that supported the claims was sorted chronologically. The various settlement methods used to resolve the issues were obtained. Furthermore, a few project participants, who dealt with claims issues, were informally interviewed and their opinions were incorporated in analysing the claims.

The claims were then segregated into different groups: civil, hydro-mechanical and electro-mechanical. Civil cases were further identified by different contract packages: C–1 to C–5. C–1 cases dealt with the construction of the 92-m-high dam, intakes, desilting chambers and part of the Head Race Tunnel (HRT). C–2 through C–4 dealt with the construction of the 23-km Head Race Tunnel and intermediate adits. C–5 dealt with the construction of the surge shaft, pressure shaft, underground power house cavern and the Tail Race Tunnel (TRT). Information obtained for each case was claim type, claim cause, amount claimed, amount resolved for payment, mode of resolution adopted and duration of settlement.

DATA ANALYSIS AND RESULTS

Table 2 indicates that 35 cases were studied and analysed, with an aggregate value of USD 34.6 million representing 25% of the total project cost (USD 887 million). USD 13.5 million (39% of claim amount) was resolved amicably through mutual consent for payment. The remaining claims (61%) were not successfully resolved because of factors such as quantity differences between the contractor claim amount and site execution, incompatibility with the contract clauses and provisions, false claims and conflicting and disputed claims. All the claims analysed originated from the contractor side. A major portion of the claims (81%) originated from civil tasks, which is attributed to the fact that most of the civil construction projects involved underground tunnelling operations subjected to adverse hydro-geological and site conditions that were different from what was expected and specified in the contract.

Table 2. Summary of Claim Amount and Frequency for Different Work Packages

Contract Package	Number of Claims	Claim Amount (USD)	Amount Resolved for Payment (USD)	Claim Resolved for Payment (%)
Overall	*35*	*34,600,491*	*13,494,451*	*39*
Civil	21	27,781,861	12,290,314	44
Hydro-mechanical	9	206,596	96,622	47
Electro-mechanical	5	6,612,034	1,107,515	17

The percentage of claims resolved for payment for different types of work is an indicator of the risk associated with each of the different types. For owners, a higher percentage of claims resolved for payment indicate a higher risk for such work types. Therefore, based on Table 2 above, hydro-mechanical projects with 47% of claims settled for payment are the riskiest for the project owner while electro-mechanical projects with 17% of claims settled for payment are the least risky. However, the overall ratio of claims awarded to claims requested of 0.39 is low when compared to similar studies done for power projects in the UAE, where ratios were as high as 0.78 (Zaneldin, 2006). Moura and Teixeira (2007) studied various projects in Portugal and discovered that the average ratio of claims awarded/claims requested was 0.76. Certainly, a more extensive treatment of risk would factor in an assessment of the total claims, the nature of those claims and the details of their settlement.

Contract, Variation Order, Claim and Dispute Resolution Procedure in This Project

In this project, a Design-Bid-Build contract with remeasurement payment was used. The unit rate was fixed for the items of the Bill of Quantity (BoQ). For deviated items and new items, the rate was fixed based on the variation order procedure established in the Contract Agreement. In this contract, the variation order, claim, dispute and arbitration procedures are adopted from the International Federation of Consulting Engineers (commonly known as FIDIC, acronym for its French name Fédération Internationale Des Ingénieurs-Conseils).

Claim Types

The types of claims were categorised based on Bramble, D'Onofrio and Stetson (1990). Almost all of the claims in this project can be categorised as either change claims or impact claims. There were no claims pertaining to performance quality and bad faith, which indicates that the contractors completed their tasks adhering to the required technical specifications and quality requirements and that the parties enjoyed a cordial relationship. The frequency of occurrence and the severity of the claim amount for each claim type are provided in Table 3.

Table 3. Frequency, Claim Amount and Duration of Settlement for Different Claim Types

Claim Type	Frequency of Claims	Claim Amount (USD)	Resolved Amount for Payment (USD)	Percentage of Claim Resolved	Average Settlement Duration (Years)
Change claims	23	17,015,230.89	9,800,491	58%	1.11
Impact claims	12	17,585,260.40	3,693,960	21%	1.37
Total	35	34,600,491.29	13,494,451	39%	1.20

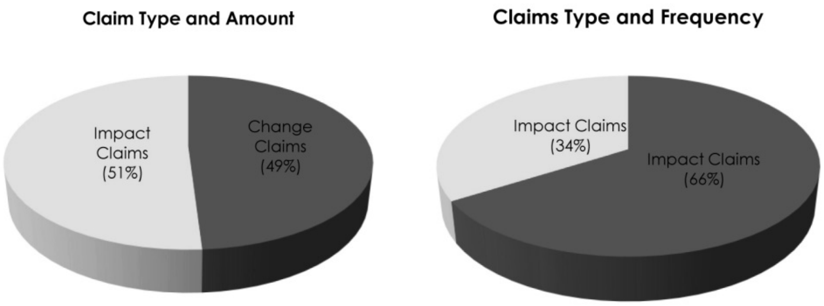


Figure 1. Claim Types, Frequency of Occurrence and Amounts (Percent)

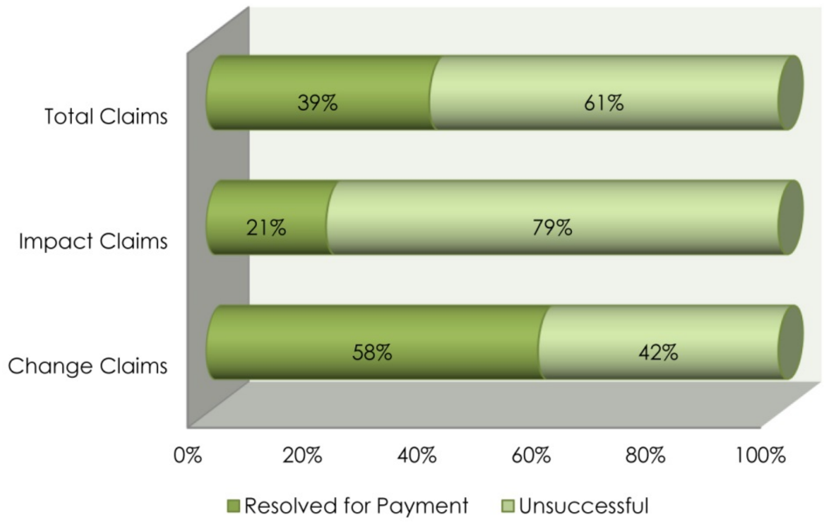


Figure 2. Claim Types and Percent of Settlement through Negotiation

Table 3 and Figure 1 indicate that change claims were much more frequent than impact claims and the claim amount was much higher with impact claims. Change Claims occurred due to formal/directed changes from the client, constructive changes on the site, design-related changes, changes due to differing/adverse site condition changes and changes due to Acts of God (e.g., floods, bad weather) while Impact Claims occurred primarily due to the loss of productivity of the workers, machinery and equipment that was left idle due to delay/disruptions beyond the control of the contractor. The primary factors giving rise to the delay/disruptions included differing/adverse hydro-geological conditions, Acts of God (e.g., floods), design changes and late site transfer by the owner.

Figure 2 indicates the percent of claims resolved for payment through negotiation for different claim types. It can be concluded that contractors were more successful with change type claims than with impact claims. Furthermore, Figure 2 indicates that contractors tend to claim more with impact claims. Claims for productivity losses and idling charges have considerable room for manipulation in terms of disputed resources and the imposition of delay losses. However, the claim amount that has been rejected is significantly higher for impact claims, which reveals that the owner does not easily take responsibility for these claims. The success of this type of claim depends on the skills and abilities of the parties to portray their rights through proper justification and interpretation of relevant contract provisions, rules and bylaws. With the change claim, the changes and quantity variations are easily quantifiable through field measurements and the contractor has minimal room to claim more or make manipulations. Therefore, these types of claims are typically easily agreed upon based on field verification. Moreover, because most of the claims are directed changes, the owner bears the responsibility of the claims and is more willing to approve payments.

Causes of Claims

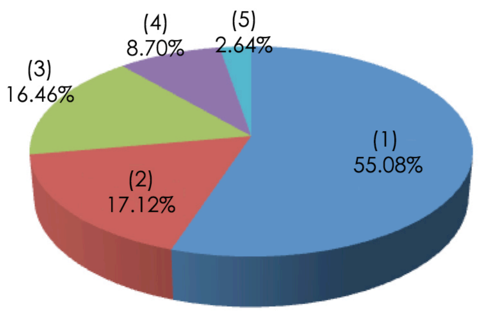
After assessing all 35 claim cases across all project components, it was determined that one type of claim source recurred in different project components and different claim types. These various claim causes can be classified into five (5) broad groups: (1) Differing/adverse site conditions, (2) Delay from project participants, (3) Changes in design and specifications, (4) Force majeure (e.g., floods) and (5) Omissions and/or ambiguous contract provisions. Table 4 provides the group ranking of claim causes in terms of severity of the claim amount.

As provided in Figure 3, claims due to differing site conditions were ranked the highest (55%) in terms of severity of claim amount while claims from change in design and specifications ranked highest in terms of frequency of occurrence (46%). Because claims due to differing site conditions lead to several changes and delays/disruptions, the severity of these claims is high. Furthermore, similar studies conducted for hydropower projects in India and Vietnam discovered differing site conditions to be the primary cause of claims. Pillai and Kannan (2001) supports the findings of this study.

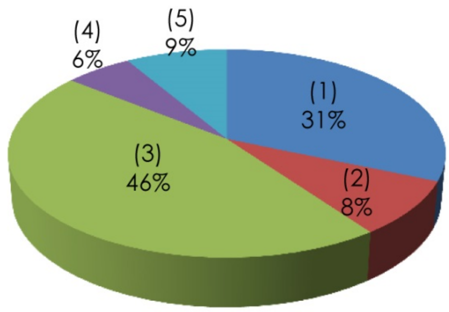
Table 4. Group Ranking of Causes of Claims

Rank	Cause of Claims	Amount Claimed (USD)	*Percent of Total Amount Claimed (%)	Frequency (Out of 35 Claim Cases)	Average Settlement Duration (Years)
1	Differing site condition	19,059,710	55	11	1.62
2	Delays of project participants	5,923,803	17	3	0.69
3	Changes in design and specification	5,694,355	16	16	0.75
4	Force majeure	3,009,030	9	2	1.63
5	Omissions/ambiguous contract provisions	913,594	3	3	1.64
	Total	34,600,491	100	35	

Note: *to the nearest whole number



Claim Cause and Amount (%)



Claim Cause and Frequency (%)

Notes: (1) Differing site conditions, (2) Delay from project participants, (3) Change in design and specifications, (4) Force majeure, (5) Omissions/ambiguous contract

Figure 3. Claim Causes: Amount and Frequency of Occurrence

The sub-groups that contributed to the claims for differing site conditions are provided in Table 5.

Table 5. (1) Adverse Geological Occurrence (AGO), (2) Change in Quarry (Inadequate Boulders) and (3) Differing Sub-Surface Condition Leading To Design Change

Differing Site Conditions	**USD 19,059,710**	
Adverse geological occurrence	9,249,362	49%
Change in quarry site (Inadequate boulders)	8,347,778	44%
Design modifications (Sub-surface condition)	1,462,570	7%

Nearly 50% of the claims due to differing site conditions resulted from adverse geological occurrences (AGO) in the tunnelling projects. This condition is where the rock type is much poorer than expected. It is characterised by a shear/faulted zone with excessive water seepage and rock fallout from the tunnel face. Additionally, the squeezing and convergence of the tunnels is an indicator of bad geology. The methods for tackling and providing support for such conditions differ from those of conventional conditions, which lead to additional work and delays/disruptions not only for the existing tasks but also for the succeeding tasks, which in turn culminates in various claims. The proposed solutions to prevent claims due to AGO are as follows: (1) Extensive geotechnical investigation during the detailed project investigation stage to establish reasonably correct geological underground information to be accordingly included in the initial BoQ and contract and (2) Special equipment and other resources needed to manage such AGO. The employer/contractor could have prior arrangements with the suppliers so that these resources could be mobilised at the earliest during such occurrences. This approach could prevent a delay in work and the ripple effect on succeeding projects.

Table 6 indicates that the delays from project participants resulted primarily from the owner side in the form of (1) Delay in handing over the site from preceding work, (2) Delay in making the site available for the next phase of work and (3) Late notice to proceed (delay in handing over the access roads). The major portion of the claims due to owner delay occurred from delay in making the site available due to delays from the preceding work (95%). Because certain tasks must be completed in sequence, the succeeding work cannot start before the prior work is completed; thus, the contractor claimed for loss of productivity of his workers, machinery and equipment, which was mobilised in accordance with the original schedule.

In this project, the client was required to construct access roads and transfer them to the contractor in accordance with the given schedule and specifications. In a few cases, the client could not make the access roads available to the contractor in the given time and in accordance with the required specifications due to unusual weather conditions, delays in getting the forest permits or Right of Way (RoW). Therefore, the contractor claimed for productivity loss of its dedicated resources, which were mobilised in accordance with the original plan.

The changes in design and specifications were the most frequent cause of claims (16 of 35 cases). Formal/directed changes from the owner were the primary cause of change claims, representing over 95% of the total changes; the remainder were constructive changes made at the site using alternate methods and materials to speed up operations.

Force Majeure (floods): The project site is situated in a subtropical region where there is heavy rain during the monsoon season. Road blockages due to landslides/soil erosion and floods due to the swelling of rivers are quite common during the monsoon season in Bhutan.

Table 6. Various Delays Caused by the Owner

Delay of Project Participants (Owner)	**USD 5,923,803**	
Delay in handing over of site from preceding contract work	5,634,967	95.12%
Delay in making site available for next phase of work/impossible schedule	272,081	4.59%
Late notice to proceed/delay in handing over (access roads)	16,754	0.28%

The monsoon in 2000 damaged significant amounts of infrastructure, which led to numerous construction projects being stalled for weeks or even months. Most access roads and service lines were cut off and tunnels at the work sites were flooded with water. Contractors experienced considerable losses of infrastructure and machinery to the flood and idleness of other equipment and resources for weeks and/or months due to the closure of the access road. The claims from the contractors were mostly in regards to the productivity loss of their resources and the rework that had to be performed for the damages caused by the flood. Moreover, there were design changes/modifications to cope with the new conditions exposed by the flood.

Claims due to omissions/ambiguous contract provisions amounted to approximately 3% of the total claim amount analysed. It appears that the contract for this project was well prepared because there were few claims due to ambiguous contracts.

MODE OF CLAIM SETTLEMENT AND DURATION

Only three of the 35 claim cases, which amounted to USD 1.89 million, went into arbitration, comprising 5% of the claims amount. The remaining claims, which amounted to USD 32.71 million, were dealt with through negotiation, of which USD 13.49 million were successfully resolved for payment. These findings support the study performed by Zaneldin (2006) in the UAE, which determined that more than 77% of claims are resolved using negotiation while only 5% of claims are resolved through litigation. This study also confirmed that most of the time contractors are reluctant to go to arbitration or litigation due to the long duration, high cost and high risk associated with this method of settlement.

Figures 4 and 5 provide the duration of claim settlements for each claim type and cause. The duration was considered from the day the contractor formally made the claim until the client made the final approval. The duration of the average claim settlement for impact claims and claims originating from omissions/ambiguous contract was 1.37 years and 1.64 years, respectively and these claims had the longest times with respect to the claim type and the source of claims.

Impact claims were associated with the delay and disruption costs that were cumbersome to quantify and were experienced throughout linking activities that referred to several clauses, therefore requiring more time. Conversely, change claims were primarily due to directed changes from the owner, which indicated that they were less disputed, based on actual quantity take-off and thus resolved more quickly.

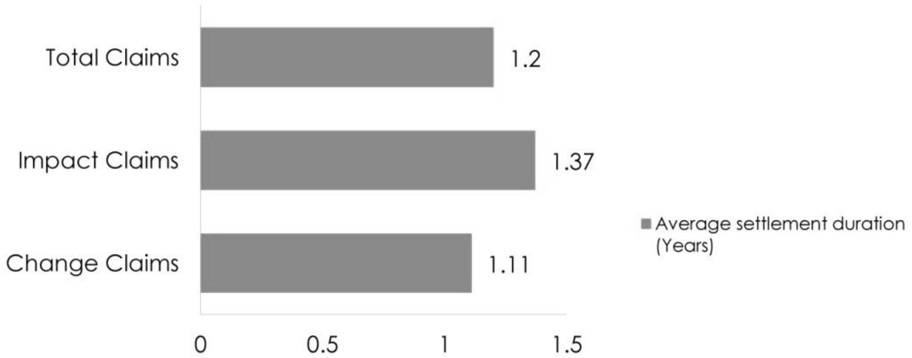


Figure 4. Claim types and settlement duration

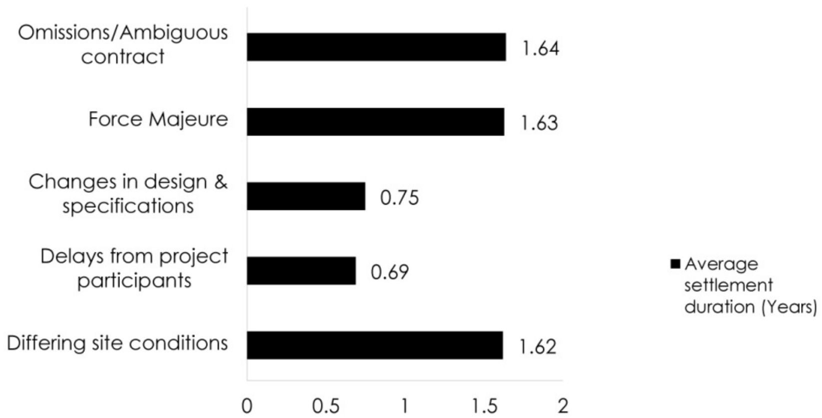


Figure 5. Claim causes and settlement durations

The fact that the claims arising from the omissions/ambiguity of contract clauses must be referred to a legal process for expert views of itself entails a considerable amount of time. Moreover, these claims are ones that were mostly disputed, could not be resolved by negotiation and had to be referred to arbitration, which prolonged the case. The claims resulting from differing site conditions and force majeure dealt with both change and impact claims that were cumbersome to address and had a longer duration. It was determined that a majority of the time was used to verify the basis of claims and their quantity calculations. The communications and correspondences between the parties until they reached a common agreement required a significant amount of time as well.

CAUSES OF CLAIMS IN DIFFERENT CONTRACT PACKAGES

The severity of the claim amounts across different contract packages was studied, as indicated in Table 7. Most claims due to differing site conditions were related to contract packages C–1 to C–5 and dealt with underground tunnelling projects. This result was primarily due to unforeseen adverse hydro-geological conditions that occurred underground. Electro-mechanical claims (underground Geographyical Information System [GIS] switchgear) were primarily from delays in handing over the site due to delays in the preceding civil tasks. This led to claims over idling charges of resources, which were mobilised in accordance with the original schedule: financial implications due to these delays, such as charges for extensions of performance, bank guarantees, insurance policies, interest charges and cost escalation and claims for acceleration programmes.

Table 7. Amount of Claims in Different Contract Packages from Various Sources of Claims

Contract Package	Amounts Claimed for Different Causes of Claims (USD)				
	Differing Site Conditions	**Delay from Project Participants**	**Change in Design and Specifications**	**Force Majeure (Flood)**	**Omissions/ Ambiguous Contract**
Civil C–1			2,932,112		414,305
Civil C–2	6,343,228	272,081	1,671,153		499,289
Civil C–3	7,638,244			644,687	
Civil C–4	2,413,425				
Civil C–5	2,572,239	16,754		2,364,343	
Electro-mechanical	92,574	5,634,967	884,493		
Hydro-mechanical			206,596.35		
Total	19,059,710	5,923,803	5,694,355	3,009,030	913,594

CONCLUSION

The primary objective of this study was to determine the different claim types and causes that occurred in the construction of a large-scale hydroelectric project in Bhutan. For each claim type and cause, analyses were performed for claim severity and frequency of occurrence.

The types of claims could be grouped under two types: Change Claims (23 of 35) and Impact Claims (12 of 35). The various identified causes of claims were combined into five (5) broad groups. The dominant cause of claims was from differing site conditions (55% of claim amount), which resulted in both changes and delays that led to several claims.

Negotiation was the primary mode of claim settlement used in this project and was determined to be the most effective in terms of cost and time. More than 95% of the claim cases were settled through negotiation and approximately 5% were dealt with by arbitration.

The duration of the claim settlement varied from a minimum of six (6) months to as long as four (4) years. The claims that were settled through negotiation took considerably less time than the arbitration cases, which took up to four (4) years. Most of the cases that took longer to settle were because of omissions or ambiguous/conflicting contract provisions/clauses (1.64 years) and claims due to force majeure (1.63 years).

All claims originated from the contractors. Overall, 39% of the amount claimed was successfully resolved for payment while 61% was unsuccessful. The various reasons for the high rejection of claims were as follows: (1) Quantity difference between the contractor's claim amount and the actual site executed, (2) Ghost work, where some tasks were not executed but were claimed by the contractor, (3) Incompatibility with required contract provisions and (4) Disputed/unwarranted claims that needed to be referred to a higher level for settlement but were later dropped by the contractor.

A significant portion of claims occurred in Civil Construction Packages (C-1 to C-5), with over 81% of the claim amounts and differing site condition claims being more prominent in underground civil (tunnelling) projects.

RECOMMENDATIONS FOR FURTHER STUDIES

1. The study of claims should be expanded to more hydropower projects (large and small, existing and ongoing/future) in Bhutan to obtain a holistic picture of the overall claims situation.
2. Structured interviews and questionnaire surveys of the project participants should be conducted to assess sentiments regarding claims issues and obtain recommendations for minimising claims.

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