

Causes of Delay in Road Construction Projects in Laos

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1. Introduction

The total length of road network in Laos is over 60,340 kilometers, which is divided into 552.02 km of Reinforced Concrete(RC), 1,203.12 km of Asphalt Concrete(AC), 9,972.96 km of Double Bituminous Surface Treatment(DBST), 23,179.14 km of gravel and 25,432.74 km of non-paved roads[1]. The annual budget for road maintenance, rehabilitation and upgrades to ensure the standards and higher road safety is still lacking.

In many countries road construction projects are often behind the schedule planed. The situation is the same in Laos, which is an important issue to management of road construction projects. It's needed to study the causes of the delays and try to look for the solution to improve them. Delay in the road construction projects has negative impacts on many areas such as overrun of budget, economy, environment and so on, particularly directly and indirectly affecting those who use or/and live near the road constructing. There are many causes which delay road construction projects in each country. Thus, it is important to find out what are the main common causes of delay in road construction projects in Laos. The main objective of this study includes the following: To identify the causes of delay in road construction projects in Laos; To identify the severity of the delay causes by owners, consultants: and contractors; To test the agreement on the ranking of the severity of the causes of delay among owners, consultants and contractors.

2. Literature Review

Mahamid et al.[2] found that there are 52 delay causes in road construction projects. Among them 18 causes of delay had the severity index scale over 60% which is very high impact level.

3. Research Methodology

3.1 Review Cause of Delay

From the literature review, there are 52 causes of delay in road construction projects. By using of editing from the literature review, along with the consultation with the engineers, there are having more than 10 years of experience in road construction projects in Laos. And modifications were made to summarize all necessary information in effective the causes of delay in road construction projects in

Laos to totaling 53 causes. In this paper a questionnaire was developed to evaluate the severity of the identified causes.

3.2 Questionnaires Design

The structure of the questionnaire was designed to have two main parts. Part I is related to respondent personal information including occupation, i.e. contractors, owners and consultants. They were further requested to answer questions pertaining to their experience in the construction industry. Part II includes the list of the identified causes of delay in road construction projects in Laos. These causes are classified into 8 main groups as shown in Table.2 according to the source of delay: project, owner, contractor, consultant, design, laborers, material and equipment, and external. For each case a question was asked: What is the degree of severity of this cause of road construction project delay? The severity was categorized into six- levels as follows: level 0 = no influence, level 1 = very low, level 2 = low, level 3 = moderate, level 4 = high, and level 5 = very high on a 0 to 5 level as shown in Table.1.

4. Data Analysis

4.1 Respondent Personal Information

The questionnaire was sent to a total of 50 contractors, 40 owners and 30 consultants, asking their contribution in ranking the identified 53 causes in terms of severity using an ordinal scale. A total of 35 contractors, 31 owners and 24 consultants filled the questionnaire.

All of respondent are engineers in' contractors, owners and consultants. Among them, 30 people had the experience between 5 to 10 years, 18 people had 10 to 15 years' experience and 42 people had over 15 years' experience. The average was approximately 16 years of experience.

Table. 1 Severity Index and Corresponding Impact Level

Range (%)	Impact level
0	No influence
0-20	Very low
20-40	Low
40-60	Moderate
60-80	High
80-100	Very High

4.2 Ranking of Delay Causes

The suggested delay causes in road construction projects are ranked by the measurement of the severity index. The following formula is used to rank them on the basis of impact level as identified by the participants:

$$\text{Severity index (\%)} = \sum a(n/N) * 100 / 5 \quad (1)$$

where a = constant expressing weighting given to each response, which ranges from 0 for no influence up to 5 for very high; n = frequency of the responses; and N = total number of responses.

Table.2 List of Delay Causes and Related groups

Main group	Causes under each group
1. Project group	1 The project's bid price is low 2 Public are affected 3 Construction area restricted 4 Inconvenient site access 5 Poor ground condition 6 Poor soil quality 7 Poor terrain condition
2. Owner group	8 Owner payment is postponing 9 Owner's decision postponing 10 Coordinating issue between Owner and Contractor. 11 Unreasonable project time frame 12 Financial status of owner 13 Postponement of project by owner. 14 Information of Materials for approve have postpones. 15 Provide scope of work is not interesting. 16 Land expropriation from owner postpone 17 An order from the project owner was issued for changes during construction.
3. Contractor group	18 Late issuing of approval documents by owner. 19 Difficulties in financing project by contractor 20 Poor communication by contractor with other construction parties. 21 Conflict between contractor and other parties 22 Poor resource management 23 Reconstruction cause is not up to standards 24 Planning ineffective management by construction 25 Poor qualification of the contractors' technical staff 26 Equipment and vehicles insufficient for construction 27 Contractor control lacking of quality 28 Improper construction Method
4. Consultant group	29 Leniency of consultant 30 Poor coordination between the consultant and contractors 31 Postpone in performing inspection by consultant 32 Low qualified inspector 33 Insufficient inspectors
5. Design group	34 Design works postpone 35 Mistakes in design 36 Inappropriate design
6. Laborers group	37 Low labor productivity 38 Low level of equipment-operator's skill 39 Insufficient laborers 40 Personal conflict between laborers and management team 41 Personal conflicts among laborers
7. Materials and equipment group	42 Lack of equipment efficiency 43 Shortage of equipment 44 Changes in material types and specifications during construction 45 Shortage in construction material
8. External group	46 Segmentation of Laos government is limited movement between areas 47 Political situation 48 Exchange rate fluctuation by contract 49 Changing of bankers' policy for loans 50 Weather condition 51 Monopoly 52 The rate of oil price increase 53 Contractor revolving money

5. Results and Discussion

In Table.3 top five of delay causes and related groups from contractors' view are shown. Their severity indices are very high, more than 80%. In Table.4 showing top five delay causes and related groups from owners and consultants' view, most of the severity indices are high but only one

cause of delay is very high. In Table.5, top five of overall delay causes ranking are shown. The severity indices of top two causes are very high and other are high.

On the other hands, in Table.3 showing top five delay causes from contractor' view and in Table.4 showing top five delay causes from owners and consultants' view, there had different causes on ranking 5 as: changing of banker' policy for loans and equipment and vehicles in sufficient for construction.

Table 3. Top Five Delay Causes and Related Groups from Contractors' View

Cause	Related group	Severity index(%)	Rank
Owner payment is postponing	Owner	91.43	1
Contractor revolving money	External	88.00	2
Financial status of owner	Owner	85.71	3
Difficulties in financing project by contractor	Contractor	82.29	4
Changing of bankers' policy for loans	External	80.57	5

Table 4. Top Five Delay Causes and Related Groups from Owners' and Consultants' View

Cause	Related group	Severity index(%)	Rank
Contractor revolving money	External	81.82	1
Owner payment is postponing	Owner	75.27	2
Difficulties in financing project by contractor	Contractor	73.82	3
Financial status of owner	Owner	68.36	4
Equipment and vehicles insufficient for construction	Contractor	66.55	5

Table 5. Top Five Delay Causes and Related Groups from Combined View

Cause	Related group	Severity index(%)	Rank
Contractor revolving money	External	84.22	1
Owner payment is postponing	Owner	81.56	2
Difficulties in financing project by contractor	Contractor	77.11	3
Financial status of owner	Owner	75.11	4
Equipment and vehicles insufficient for construction	Contractor	70.89	5

6. Conclusion

The severity indices of the causes of delay are evaluated from the contractors' view, owners and consultants' view, through questionnaire survey form 53 causes of delay are discussed in this study. And the top five of the severity indices causes of delay as seen from overall delay causes ranking are the following: 1. Contractor revolving money 2. Owner payment is postponing 3. Difficulties in financing project by contractor 4. Financial status of owner 5. Equipment and vehicles insufficient for construction. From the results in these studied, one of necessity in future works, it is needed to have to use the severity indices are very high causes of delay to gain a baseline to modify rules, agreements, management, administration and planning. And check the result percentage delay of road construction projects are having reduced or not.

References

- [1] Source by statistic from Department of Roads 2019, Ministry of Public Works and Transport of Laos.
- [2] Causes of Delay in Road construction Projects: Journal of management in engineering / July 2012 / pp.300-310.