

## 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

In this paper, a questionnaire was developed to evaluate the severity of the identified causes. The questionnaire was developed based on the literature review and through consultations with the engineers, who have more than 10 years of experience in road construction projects in Laos. There are 52 causes of delay in road construction, then they are modified and summarized thus in

total there are 53 questions in the questionnaire.

#### 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 |
| 20        | Very low     |
| 40        | Low          |
| 60        | Moderate     |
| 80        | High         |
| 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.                        |
| 3. Contractor group              | 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. |
|                                  | 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                               |
| 4. Consultant group              | 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  |
| 5. Design 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   |
|                                  | 34 Design works postpone   |
|                                  | 35 Mistakes in design  |
| 6. Laborers group                | 36 Inappropriate design  |
|                                  | 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, Table.3 shows the top five of delay causes from contractor's view and Table.4 shows the top five delay causes from owners and consultants' view. there were different causes on rank 5 as followed: 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 this study, one of necessity in future works is that it is needed to make a trial using the severity indices developed by this study to identify causes of delay to gain a baseline to modify rules, agreements, management, administration and planning, and check the result if the percentage delay of road construction projects are 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.