

Factors affecting the delay in construction at Mentawai island, Indonesia

E. Elfi, Mahmood Md Tahir, Siti Asiah Tukirin

Institute for Smart Infrastructure and Innovative Construction, UTM Construction Research Centre,
School of Civil Engineering, Faculty of Engineering, Universiti Teknologi Malaysia, 81310, Johor Bahru,
Johor, Malaysia

Email: mahmoodtahir@utm.my

Abstract. Currently, the construction sector became the backbone of the Indonesian economy, with infrastructure development being intensified in Indonesia. Construction of infrastructure projects and construction projects is generally overshadowed by project delays. The geographical position of the Mentawai Islands separated from the main island has the potential for project delays. This paper presents research on the factors causing project delays in the Mentawai Islands. The study was based on survey methods using questionnaires to stakeholders in construction projects in the Mentawai Islands. Of 77 respondents, was found that the main factors causing delays are weather problems, lack of manpower and incomplete planning documents.

1. Introduction

1.1. Background

The Project Management Institute (PMI) defines a project as "a temporary endeavour to create a unique product, service and result" [1]. The project has characteristics as activities that are temporary, indicating the project has a specific duration with a start and finish time of a particular project. The project is completed when the project objectives to produce a product or service are met, or the project can be stopped when it is certain that the project objectives will not be achieved. A more detailed project definition is given by Kerzner [2] who gives the characteristics of project activities: having specific objectives that are completed with certain specifications, having a start and finish date, having financing limits, needing human and other resources, and project activities are multifunctional. Project definitions from PMI and Kerzner clearly show that project activities have specific objectives and to achieve these objectives there are limits to their implementation. In terms of time it is seen that time factor is one of the main parameters in a project.

The construction industry has become the backbone of the economy, where the construction industry's contribution to Indonesia's GDP reaches 5-10%. The construction sector provides infrastructure and facilities for economic activities while also employing more than five million workers in Indonesia. In the administration of President Joko Widodo and Jusuf Kalla the infrastructure sector received considerable attention. In RPJMN III (2015-2019), funds are budgeted at almost 6,500T for infrastructure. The infrastructure development includes the construction of 2,350km of new roads, 1,000km of toll roads, construction of 15 new airports, construction of 3,258KM of railway lines, construction of twin-block flat towers, and various other infrastructure developments.

Each construction project has a plan and schedule for its implementation and in the implementation of construction projects, and there are several components that must be fulfilled so that the project can run according to a predetermined plan and schedule, which can be completed on time. However, in its



Content from this work may be used under the terms of the [Creative Commons Attribution 3.0 licence](https://creativecommons.org/licenses/by/3.0/). Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.

implementation, not all construction projects go according to the plans that have been made. This is due to the existence of several factors that do not match the planning that has been made with the conditions that occur in the field, causing delays in project implementation. The construction of infrastructure projects in Indonesia, which is being intensively implemented, also has problems in delays. In general, lagambata is a phenomenon encountered in project implementation.

Project delays can come from service providers or service users, as well as other parties. This delay will have additional time and can also add to the costs that are beyond the plan. If the delay comes from the contractor (service provider), the contractor may be fined, as well as if the delay comes from the service user, the service user will pay the loss borne by the service provider. Several studies have been done to find out the factors that cause delays in project completion. Project delays also occur in the Mentawai Islands Regency. This district is one of the districts in West Sumatra Province. The Mentawai Islands Regency consists of 10 Districts and consists of four main islands. Geographically the Mentawai Islands are surrounded by the Indian Ocean and separated from the mainland of Sumatra Island (Figure 1). Because of these conditions, in this study a study of the factors that caused the project delay in the Mentawai Islands was conducted.



Figure 1. Location of Mentawai Island

1.2. Construction Delay

1.2.1 Definition of Delay

Delay, according to Ervianto [3] is that the implementation time is not utilized following the activity plan, causing one or several following activities to be delayed or not completed according to the planned schedule. According to Lewis and Atherley [4], if a job has been targeted, it must be completed at a predetermined time, but for some reason it cannot be fulfilled; it can be said that the job has been delayed. This will have an impact on the initial planning as well as on financial issues. Delays that occur in a construction project will extend the duration of the project or increase costs or both. The impact of the delay on the client or owner is the loss of the opportunity to put his resources into another project, increasing the direct costs incurred, which means that the increase in expenses for employee salaries, equipment rental, and so on and reduce profits.

According to Callahan [5], the delay is an activity or construction project activity experiencing additional time, or not held following the expected plan. Project delays can be clearly identified through a schedule. By looking at the schedule, the consequences of delays in an activity on other activities can be seen and expected to be anticipated.

From the above definition, it can be seen that delay is an event where the implementation of an activity exceeds the initial planning of a project.

1.2.2 Types of Delays

The delay in construction projects is widespread. When delays occur on a project, the need to restore delays appears to minimize costs due to the delay [6]. In many publications [7-14], delays are divided into three types, namely non-excusable delay, compensable delay, and excusable delay. Excusable Non-Compensable Delay is a project delay where the cause of delay is caused by the control of service providers and service users. This type of delay is: (i) Act of God, such as natural disturbances including earthquakes, tornadoes, volcanic eruptions, floods, fires, and others, (ii) Force Majeure, is all the cause of the Act of God, then wars, riots, demos, employee strikes, and others, (ii) Weather, when the weather becomes unfriendly and exceeds normal conditions, this becomes a factor that can be forgiven for delay (Excusing Delay).

Excusable Compensable Delays are delays caused by the owner or client. For this type of delay, the contractor has the right to renew the time and claim for the delay because the delay was caused by the owner. The causes of delay included in Compensable and Excusable Delay are (i) Late total project location (site) submission, (ii) Late payment to the contractor, (ii) Errors in images and specifications, (iii) Delays in detailing work, (iv) Late approval of fabrication drawings. Non-Excusable Delays, this delay is entirely the responsibility of the contractor because the contractor extends the time of execution of the work so that it has passed the agreed completion date. This delay is a delay that can be predicted and avoided by contractors. The sources of the causes of delay include (i) Errors in coordinating work, materials, and equipment, (ii) Errors in project financial management, (iii) Delays in shop drawing/drawing submission, (iv) Mistakes in hiring incompetent personnel.

1.2.3 Source of Causes of Delay

Based on the types of delays discussed earlier, the sources of the delay can be identified, where the sources are grouped into three types. The sources of the causes of delay include [15-17]: Late payment; by the client owner; Implementation of the stages of bad work by the contractor; Errors in material management by contractors; Lack of labor by contractors; Heavy rain / waterlogged work location; Different land conditions than expected; Additional work requested by the client owner; Changes in plumbing, structural, electrical work; Errors in planning and specifications; Planning uncertainty and specifications; Changes in planning and specifications; Changes in work methods by contractors; Errors in interpreting images or specifications; Planning a schedule of unfavorable work by the contractor; Less optimal productivity from contractors; Changes in the scope of the consultant's work; Strikes carried out by contractors; Repair the finished work; Improve damage to a job due to a strike; Late shop drawing approval by a consultant. Project delay is one type of construction project risk. For project risks in West Sumatra, Atmaja [18] has researched contractors in the city of Padang. Using the questionnaire method, Atmaja conducted a risk analysis with respondents of 30 Gapensi member contractors consisting of 7 large contractors, 8 intermediate contractors, and 15 small contractors. Using a scale of 1 to 3 for the frequency and impact of risk, the five main risks for contractors in the city of Padang are in the following table 1.

Table 1. Risk level comparison according to contractor classification (Atmaja, 2007)

Contractor Classification	Risk	Level of Risk	
Large Contractor	Influence of the weather	6.6	Medium
	Licensing work approval to the owner	6.3	Medium
	Increase in job prices	5.9	Medium
	Illegal levies by certain individuals	5.7	Medium
	Increase in labor costs	5.6	Medium
	Intermediate Contractor	Changes in material / material prices	6.0
Security, safety, protection of the work environment		5.9	Medium
Poor supplier & subcontractor performance		5.3	Medium
Influence of the weather		5.1	Medium
Delay by third parties (subcontractors, suppliers)		5.1	Medium
Small Contractor		Changes in material / material prices	4.9
	Complex bureaucracy / licensing	4.5	Medium
	Weaknesses in control and supervision	4.5	Medium
	Large legal process costs	4.3	Medium
	Illegal levies by certain individuals	4.3	Medium

2. Methodology

This study uses survey methods using questionnaire methods. This method is commonly used in research in project management [19]–[21]. The questionnaire was designed to identify the factors causing delays in construction projects in the Mentawai Islands. The questionnaire was designed to consist of two parts. The first part is in the form of respondent information, and the second part is the source of the causes of delay. From the literature study, 22 sources of project delays have been identified, and then in the questionnaire, they are arranged in table form. Respondents were asked to answer on a scale of 1 to 4 for the source of the cause of the delay where 1 means 'very ineffectual' and 4 means 'very influential'. To determine the ranking or ranking of the factors causing delays in the Project in the Mentawai Islands, the respondent's answers are analyzed by the importance index based on the respondents' average perceptions using the formula in the following equation (1):

$$\text{Mean} = \sum_i^4 = I \frac{aiXi}{N} \tag{1}$$

where:

I = Importance Index

Xi = frequency of response from each perception

ai = value for given perception (1, 2, 3, 4)

N = amount of data

The research questionnaire was addressed to the Contractor as the project implementer, supervisory consultant, and from the project owner. The questionnaire was first tested in the form of a pilot test to see whether the questionnaire could be understood and understood by the respondents. Based on the results of the pilot test, repairs to the questionnaire and questionnaires were prepared to be distributed. There are several methods for distributing and collecting questionnaires, such as the most popular is by postal mail. With the consideration that the respondents were in the Mentawai Islands, where postal access was limited, the direct collection method was chosen in this study. The researcher comes directly to the office of the contractor, consultant or owner (from the Public Works department). The researcher came and submitted the questionnaire directly and came back to collect the questionnaire. This method, as in other studies, produces a great return rate. The questionnaires were distributed and collected in two weeks in January 2018. In this study, 77 questionnaires were collected with the following details:

Table 2. Profile of the Respondents

Category	N	Percentage (%)
Owners (PPTK)	11	14%
Contractors	50	65%
Supervision consultants	16	21%
Total	77	100%

3. Results and Discussion

The factors related to the delay in construction were identified using questionnaires collected from 77 respondents comprised of contractors, consultants, developers, and clients. The factors of the delay in the project in the Mentawai Islands are presented in Table 3 below. The ranking in the Table is obtained from respondents' answers on the questionnaire using a 1-4 Likert scale.

Table 3. Ranking of the Causes of Delay Factors

N0	Factors of Delay	Mean	Rank
1	Late payment by the owner	2.45	15
2	Poor stage implementation	3.00	8
3	Material management errors	3.03	7
4	Shortage of labor	3.38	2
5	Bad weather	3.61	1
6	Land condition	2.97	9
7	Extra work	2.23	19
8	Change of work	2.34	17
9	Errors in planning and specifications	3.10	4
10	Unclear in planning and specifications	3.08	5
11	Change planning and specifications	2.84	11
12	Errors in interpreting images or specifications	2.95	10
13	Changes in work methods by contractors	2.66	14
14	Inappropriate schedule planning	2.95	10
15	Productivity is not optimal by contractors	3.05	6
16	Change in the scope of work by consultants	2.40	16
17	Strike	3.16	3
18	Job repair	2.32	18

N0	Factors of Delay	Mean	Rank
19	Repair damage caused by strikes	2.69	12
20	Late shop drawing approval	2.68	13
21	Work coincides with the fasting month and Eid	2.08	19
22	Project implementation at the beginning of the year	2.04	20

In the table above, of the 22 factors that cause project delays in the Mentawai Islands, there are five factors with the highest mean values. These factors are 1. Bad weather; 2. Labour shortages; 3. Strikes; 4. Errors in planning and specifications; and 5. Unclear in planning and specifications.

Bad weather factors are the most influential factors on project delays, with the results of the questionnaire survey obtaining a mean of 3.61. This value is much higher than the ranking factor 2 (lack of labour), which has a mean value of 3.38. These results indicate that respondents consider the weather problem to be very influential. In accordance with its location surrounded by the sea, the climate in the Mentawai Islands is strongly influenced by the monsoon winds. The air condition is always hot and humid. Rainfall ranged from 2,500 - 4,700 mm / year, with the number of rainy days between 132-2267 rainy days per year. While the temperature conditions range from 22° - 32°C with humidity 82 - 85% [22]. The data also shows that around 70% of the day in the year, there will be rain and quite high rainfall. This will certainly affect the implementation of the work.

The weather factor also affects the transportation sector from the Mentawai Islands to Padang City on Sumatra Island. The main material for construction work and also heavy equipment is still carried from the city of Padang by boat. Shipping and shipping of materials and equipment are greatly affected by weather conditions. Mesah et al. [23] research show that the factors of material delay or material mobilization to the location. From Table 3, it can be seen that the factors with the highest average after the weather factor are strikes and lack of labour. Workers for construction projects are brought in from outside the Mentawai Islands because local communities are generally profession as cultivators [24].

The next most influential factor from Table 3 is errors and obscurity in the planning document and specifications. This indicates that the planning process of construction projects in the Mentawai Islands has incompleteness, which at the time of implementation of the planning document is unclear, and there are errors.

4. Conclusion

The questionnaire survey conducted in this study shows that the main factors causing delays in the Mentawai Islands are weather factors, human resource factors, and planning factors. Research shows that this is influenced by the geographical position of Mentawai, which is on the islands and separated from the main island. It was concluded that the main factors causing delays are weather problems, lack of manpower and incomplete planning documents.

References

- [1] PMI, *A guide to the project management body of knowledge (PMBOK Guide)*, Fourth Edi. Newton Square, Pennsylvania: Project Management Institute, 2008.
- [2] H. Kerzner, *Project Management: A System Approach of Planning, Scheduling and Controlling*. John Willey & Son, 2009.
- [3] W. I. Ervianto, "Manajemen proyek konstruksi." Yogyakarta. Andi Offset, 2005.
- [4] T. M. Lewis and B. A. Atherley, "Analysis of construction delays," in *Proceedings of the International Symposium for the Organization and Management of Construction: Shaping Theory and Practices*, 1996, vol. 2, pp. 60–71.
- [5] M. T. Callahan, *Construction delay claims*. Aspen publishers, 2010.
- [6] S. T. Ng, M. Skitmore, M. Z. M. Deng, and A. Nadeem, "Improving existing delay analysis

- techniques for the establishment of delay liabilities,” *Constr. Innov.*, vol. 4, no. 1, pp. 3–17, 2004.
- [7] M. R. Abdullah, I. A. Rahman, and A. A. A. Azis, “Causes of delay in MARA management procurement construction projects,” *J. Surv. Constr. Prop.*, vol. 1, no. 1, 2010.
- [8] H. Mohammadhosseini, N. H. A. S. Lim, M.M.Tahir, R. Alyousef, H.Alabduljabbar and M. Samadi. 'Enhanced performance of green mortar comprising high volume of ceramic waste in aggressive environments'. *Const. and Buil. Mater.* 212, pp.607-617, 2019
- [9] H. A. Al-Saggaf, “The five commandments of construction project delay analysis,” *Cost Eng.*, vol. 40, no. 4, p. 37, 1998.
- [10] N. H. A. S. Lim, H. Mohammadhosseini, M. M. Tahir, M. Samadi and A.R.M. Sam. 'Microstructure and strength properties of mortar containing waste ceramic nanoparticles'. *Arab. J. for Sci. and Eng.* 43(10), pp.5305-5313, 2018.
- [11] D. Arditi, S. Nayak, and A. Damci, “Effect of organizational culture on delay in construction,” *Int. J. Proj. Manag.*, vol. 35, no. 2, pp. 136–147, 2017.
- [12] A. S. M. A. Awal, H. Mohammadhosseini, 'Green concrete production incorporating waste carpet fiber and palm oil fuel ash'. *J. of Clean. Prod.*, 137, pp.157-166, 2016.
- [13] A. A. Salunkhe and R. S. Patil, “Effect of construction delays on project time overrun: Indian scenario,” *Int. J. Res. Eng. Technol.*, vol. 3, no. 1, pp. 543–547, 2014.
- [14] S. A. H. Tumi, A. Omran, and A. H. K. Pakir, “Causes of delay in construction industry in Libya,” in *The International Conference on Economics and Administration*, 2009, pp. 265–272.
- [15] H. Mohammadhosseini, M. M. Tahir, M.M., 'Durability performance of concrete incorporating waste metalized plastic fibres and palm oil fuel ash'. *Constr. and Build. Mater.*, 180, pp.92-102, 2018.
- [16] Suyatno, “Analisis faktor penyebab keterlambatan penyelesaian proyek gedung,” *Tesis*. Universitas Diponegoro, 2010.
- [17] H. Mohammadhosseini, M. M. Tahir. 'Production of sustainable fibre-reinforced concrete incorporating waste chopped metallic film fibres and palm oil fuel ash'. *Sādhanā*. 43(10), p.156, 2018
- [18] A. Atmaja, “Manajemen risiko bisnis konstruksi (studi kasus: kontraktor daerah kota Padang),” Universitas Andalas, 2007.
- [19] D. A. Dillman, *Mail and Internet surveys: The tailored design method--2007 Update with new Internet, visual, and mixed-mode guide*. John Wiley & Sons, 2011.
- [20] M .M. Tahir, H. Mohammadhosseini, S. P. Ngian, M. K. Effendi, 'I-beam to square hollow column blind bolted moment connection: Experimental and numerical study'. *J. of Const. Steel Rese.*, 148, pp.383-398, 2018.
- [21] W. L. Neuman and L. W. Neuman, *Workbook for Neumann Social research methods: qualitative and quantitative approaches*. Allyn & Bacon, 2006.
- [22] DitjenDPT, “Kabupaten Kepulauan Mentawai,” 2017. [Online]. Available: <http://ditjenpdt.kemendesa.go.id/potensi/district/70-kabupaten-kepulauan-mentawai>. [Accessed: 20-Apr-2018].
- [23] Y. A. Messah, T. Widodo, and M. L. Adoe, “Kajian Penyebab Keterlambatan Pelaksanaan Proyek Konstuksi Gedung di Kota Kupang,” *J. Tek. Sipil*, vol. 2, no. 2, pp. 157–168, 2013.
- [24] A. Febrianto and E. Fitriani, “Orang Mentawai: Peladang tradisional dan ekonomi pasar,” *Humanus*, vol. 11, no. 2, pp. 119–133, 2012.