International Journal of Mechanical, Electrical and Civil Engineering
Volume. 2 Number. 1, Year 2025
e-ISSN : 3047-4531, and p-ISSN : 3047-4523, Page. 237-244
DOI: https://doi.org/10.61132/ijmecie.v2i1.213
Available online at: https://international.aritekin.or.id/index.php/IJMECIE

Time Management Analysis of the Construction of the Kali Tuan Dam Project in Indramayu Regency

Ibnu El Musayyab*[1], Lulu Raudlatul Aulia[2], Heri Mulyono[3], Ohan Farhan[4]
[1-4] Universitas Swadaya Gunung Jati, Cirebon, Indonesia
ibnuelem@gmail.com[1] , *luluraudlatul1 2@gmail.com*[2] , *mulyonoh29.doc@gmail.com*[3], *ohanfarhan82@gmail.com*[4]

Address: Jl. Pemuda Raya No.32, Sunyaragi, Kec. Kesambi, Cirebon City, West Java 45132
*Author Corresprodence : ibnuelem@gmail.com**

Abstract. *Dams are structures designed transversally across rivers and play a role in increasing water elevation. This study discusses whether the construction of dams in Krimun Village, Indramayu has met the feasibility. The results of surveys and interviews with local communities were collected as primary data, while information from various sources such as literature, government documents, and climatology data are secondary data. The researcher chose a research method through literature studies, as well as data analysis. The finalization of this study showed that the CPM method adapted as the construction method for the Kali Tuan Dam obtained a time difference of 29 days. The calculation starts from the initial planning time with the CPM time. Initially, the estimated duration of this project was 120, but it turned out to be shortened to only 91 days. On the other hand, this accelerated duration has an impact on the project calculation costs which have increased from IDR 1,476,703,244.59 to IDR 1,523,841,512.45.*

Keywords: *Construction Management, Dam, Critical Path Method e (CPM)*

1. INTRODUCTION

One of the buildings with a construction that crosses the river flow made of stone masonry, or gabions or concrete that functions to raise the water level to be channeled to the required place is called a dam. In addition to its role as irrigation, the dam also functions as *a supplier* of drinking water for the general public and as a power plant.

Having urgency as a discipline of human resource management that highlights the objectives of project development and its finalization, in fact construction management itself is one type of theorems of how the functions of leader and coordinator are carried out in a series of project activities. Judging from the etymology of the "construction management" is rooted in the word "management" which means the art of organizing and managing. In the scope of construction there are many structured stages. Stages such as planning, organizing, executing, and controlling *in* a project are interconnected relationships and none of them can be missed. If construction management is not implemented, then quality *output*, *on time*, *and on budget will not be obtained. Lawrence* Apply and George R. Terry have stated a more specific understanding of management that is closely related to a person's leadership and coordination skills in realizing goals with the steps that should be.

We realize that water in everyday life cannot be replaced, and the same goes for the Kali Tuan Movable Dam construction project in Krimun Village, Indramayu Regency, which began construction in July 2024 with the expectation of completion in October 2024. Throughout the existing period, the project received excellent project management.

Received: Desember 31, 2024; Revised: January 15,2025; Accepted: January 29, 2025; Published: January 31, 2025

controlling aspects or regular monitoring *up to date*, researchers immediately went to the field to study further in order to obtain a clear description. Furthermore, coordinate with the contractor for strategic decision making, which has significant consequences and lasts for a long period of time. This is done so that the work stages can run optimally, effectively, and efficiently. Researchers hope that this study will bring results in the form of recommendations for the duration of work and more efficient costs in the Kali Tuan dam construction project.

2. METHOD

Researchers integrate quantitative and qualitative methods in their research design. The choice of quantitative methods is based on their advantages in presenting data that can be measured and analyzed statistically. While qualitative methods are chosen because they are able to provide a deeper and more comprehensive understanding. The integration of these two methods is expected to provide a more complete understanding of the phenomena being studied.

multi-method approach adopted in this study involves a combination of CPM, bar chart, and S-curve for in-depth network analysis. Through this combination, identification of crucial activities can be clearly identified, project schedules can be displayed visually, *real- time* project progress can be monitored, resource utilization can be optimized, and delay risks can be minimized.

CPM (Critical Path Method)

In the project planning framework, CPM (Critical Path Method) provides a structure for understanding and managing the relationships between activities. Nodes in a CPM diagram represent activities, while lines/arrows represent dependency relationships. The critical path, which is the longest sequence of activities, has varying durations and requires careful management. CPM helps identify critical activities that require special attention to avoid project delays.

Forward and backward calculations are two complementary techniques used to identify the critical path. Together, they enable project managers to understand the time constraints of each activity and make informed decisions. Thus formulated:

EF = ES + D……………………………………………………………………………(1)

LS = LF – D……………………………………………………………………………(2)

Where :

EF (Early Finish) **:** The fastest time an activity can be completed.

ES (Early Start) **:** The earliest time an activity can start.

LS (Late Start) **:** The latest time an activity can still be started without delaying the project as a whole.

LF (Late Finish) **:** The latest time an activity can be completed without causing delays to the project.

D (Duration) **:** The length or duration required to complete an activity.

Critical path identification is done after forward and backward calculations. The goal is to find paths that have the potential to cause project delays, using *the total float* as the basis for calculation. In this case it is formulated:

TF = LS – ES or LF – EF ……………………………………………………………………………………………(3)

Where:

TF : the amount of time an activity is allowed to be delayed, without affecting the overall project schedule.

3. RESULTS AND DISCUSSION

Before the analysis, the project undergoes a decomposition process to facilitate understanding of dependencies between jobs and more accurate duration calculations. Data from the PUPR Office of Indramayu Regency is used as a reference for assigning codes and numbers to each sub-job.

Table 1. Work *Table Breakdown Structure*

No	Code	Activity Description
1	A	Administration and Documentation
2	B	Settings Out
3	C	Making Kisdam
4	D	Creating a Diversion Channel
5	E	Water Pump Operation
6	F	Digging the ground with an excavator Short Arm
7	G	Manual Earth Excavation (Foundation)
8	H	Procurement of Materials for Piling
9	I	Concrete Pile Driving
10	J	Pre-cast Concrete Piling
11	K	Steel sheet pile driving
12	L	Manual Concrete Reinforcement
13	M	Semi-mechanical Concrete Reinforcement
14	N	Formwork
15	O	K.100 Casting
16	P	Ready Mix Casting K.250
17	Q	Railing

18	R	Sluice
19	S	Painting
20	T	Opening of Kisdam
21	U	Diversion Channel
22	V	River Normalization

After breaking the project into smaller parts, a linkage analysis is conducted to understand the logical sequence of implementation and identify work that can be done simultaneously. The information on the Kali Tuan Dam Construction project is presented in the following table:

Table 2. Description of CPM Method Activities

No	Code	Activity Description	Activity Predecessor	Duration
1	A	Administration and Documentation	-	2
2	B	Settings Out	A	2
3	C	Making Kisdam	B	5
4	D	Creating a Diversion Channel	C	5
5	E	Water Pump Operation	C	1
6	F	Digging the ground with an excavator Short Arm	C	2
7	G	Manual Earth Excavation (Foundation)	C	3
8	H	Procurement of Materials For Erection	C	51
9	I	Concrete Pile Driving	H	6
10	J	Pre-cast Concrete Piling	H	5
11	K	Steel sheet pile driving	H	4
12	L	Manual Concrete Reinforcement	H	4
13	M	Semi-concrete reinforcement mechanical	H	11
14	N	Formwork	M	9
15	O	K.100 Casting	M	2s
16	P	Ready Mix Casting K.250	M	10
17	Q	Railing	0	7
18	R	Sluice	N	7
19	S	Painting	P	10
20	T	Opening of Kisdam	O	5
21	U	Closing of the Diversion Channel	Q	5
22	V	River Normalization	C	31

Before the forward and backward network calculations are performed, a network diagram is created based on the CPM method activity description table, which details each activity and its duration. The earliest start time for all activities in the network is equated to.

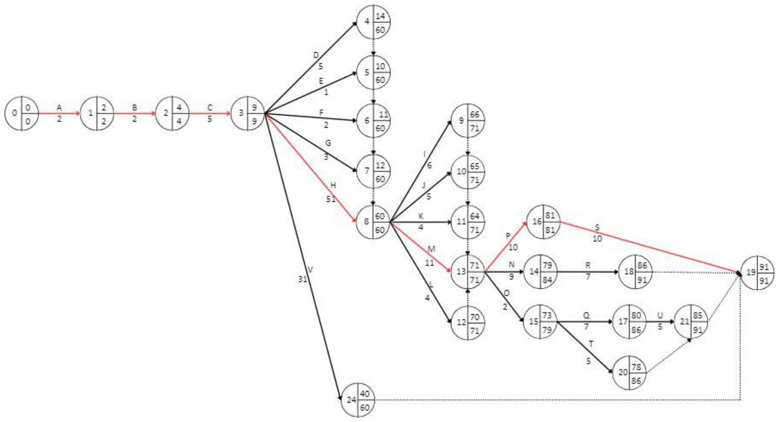

Figure 1. Network Diagram

Table 3. Network Diagram Is Created Based on the CPM Method Activity Description

NO	ACTIVITIES	DURATION	FORWARD CALCULATION		BACKWARD CALCULATION		TF
			ICE	EF	LS	LF	
1	A	2	0	2	0	2	0
2	B	2	2	4	2	4	0
3	C	5	4	9	4	9	0
4	D	5	9	14	86	91	77
5	E	1	9	10	90	91	81
6	F	2	9	11	89	91	80
7	G	3	9	12	88	91	79
8	H	51	9	60	9	60	0
9	I	6	60	66	65	71	5
10	J	5	60	65	66	71	6
11	K	4	60	64	67	71	7
12	L	4	60	64	67	71	7
13	M	11	60	71	60	71	0
14	N	9	71	80	72	81	1
15	O	2	71	73	79	81	8
16	P	10	71	81	71	81	0
17	Q	7	73	80	74	81	1
18	R	7	81	88	84	91	3
19	S	10	81	91	81	91	0
20	T	5	73	78	86	91	13
21	U	5	81	86	86	91	5
22	V	31	9	40	29	60	20

Analysis of the diagram and calculations resulted in the identification of the project's critical path involving 7

activity units, coded A, B, C, H, M, P, and S. Any delay in these activities will directly affect the total duration of the project. The next step is to calculate the cost difference between normal conditions and after acceleration.

Table 4. Activity Description

Activity Description	Normal Fee		After Cost Acceleration	
Administration and Documentation	Rp.	5,000,000.00	Rp.	9,000,000.00
Settings Out and Mobilization	Rp.	23,367,000.00	Rp.	32,140,000.00
Making Kisdam	Rp.	5,890,857.28	Rp.	4,379,773.44
Creating a Diversion Channel	Rp.	5,194,112.00	Rp.	5,688,019.20
Water Pump Operation	Rp.	692,274.00	Rp.	723,741.00
Digging the ground with Excavator Short Arm	Rp.	2,901,236.18	Rp.	3,177,114.22
Manual Earth Excavation (Foundation)	Rp.	979,635.89	Rp.	1,052,118.90

Activity Description	Normal Fee		After Cost Acceleration	
Procurement of Round Concrete Piles	Rp.	234,092,833.09	Rp.	285,829,482.24
Procurement of concrete sheet piles pre-cast	Rp.	171,277,469.01	Rp.	197,860,279.68
Procurement of steel sheet piles	Rp.	212,621,878.92	Rp.	121,485,326.00
Pile Driving Concrete Pile	Rp.	27,115,108.80	Rp.	28,366,189.80
Concrete Sheet Piling pre-cast	Rp.	10,120,809.44	Rp.	10,595,304.16
Steel sheet pile driving	Rp.	4,979,869.50	Rp.	5,216,071.50
Concrete Reinforcement Method manual	Rp.	14,107,297.86	Rp.	14,766,791.40
Semi-concrete reinforcement mechanical	Rp.	133,280,863.09	Rp.	107,945,485.56
Formwork	Rp.	38,734,545.41	Rp.	49,803,931.54
Formwork scaffolding with bamboo	Rp.	23,141,737.96	Rp.	20,887,438.04
K.100 Casting	Rp.	5,129,600.85	Rp.	6,978,661.79
Ready Mix Casting K.250	Rp.	179,021,549.85	Rp.	219,602,501.27
Casting using a pump concrete	Rp.	75,943,273.12	Rp.	62,773,589.62
Concrete Compaction	Rp.	12,606,165.00	Rp.	7,056,695.17
Railing	Rp.	9,544,489.63	Rp.	6,165,177.89
Sluice	Rp.	154,164,391.01	Rp.	169,330,294.35
Painting	Rp.	4,654,130.81	Rp.	2,906,202.79
Opening of Kisdam	Rp.	5,890,857.28	Rp.	4,379,773.44

Diversion Channel	Rp.	5,194,112.00	Rp.	5,688,019.20
River Normalization	Rp.	120,601,636.24	Rp.	140,043,530.23
TOTAL =	**Rp.**	**1,486,247,734.22**	**Rp.**	**1,523,841,512.45**

Based on the cost calculation, there was an increase of 2.53%, from Rp 1,486,247,734.22 to Rp 1,523,841,512.45 after the acceleration.

4. CONCLUSION

Drawing conclusions from the data analysis and previous discussions, the researcher revealed that the CPM method applied to the Kali Tuan Dam construction project resulted in a time difference of 29 days between the planned schedule and the CPM calculation results. The project duration decreased from 120 days to 91 days. As a result, there was an increase in costs from Rp1,476,703,244.59 to Rp1,523,841,512.45.

REFERENCES

Ansori, M. B., Edijatno, & Soesanto, S. R. (2018). *Irigasi dan bangunan air*. Surabaya: Institut Teknologi Sepuluh November.

Appley, A. L., & Lee, O. L. (2010). *Pengantar manajemen*. Jakarta: Salemba Empat.

Arsyad, S. (2010). *Konservasi tanah dan air*. Bogor: IPB Press.

Departemen Pekerjaan Umum, Sub Direktorat Jenderal Pengairan. (2013). *Standar perencanaan irigasi: Kriteria perencanaan bagian jaringan irigasi*. Jakarta: Departemen Pekerjaan Umum.

Ervianto, W. I. (2004). *Manajemen proyek konstruksi* (Edisi revisi). Yogyakarta: Andi.

Fayol, H. (1916). *General and industrial management*. London: Pitman.

Goldratt, E. (2010). *Theory of constraints*. United States: McGraw-Hill.

Kerzner, H. (2017). *Project management: A systems approach to planning, scheduling, and controlling*. Hoboken, NJ: John Wiley & Sons.

Labombang, M. (2011). *Manajemen risiko dalam proyek konstruksi*. Palu: Universitas Tadulako.

Lock, D. (2007). *Project management*. Farnham: Gower Publishing.

Nurhayati. (2010). *Manajemen proyek*. Jogjakarta: Graha Ilmu.

Project Management Institute. (2000). *A guide to the project management body of knowledge (PMBOK guide)*. Newtown Square, PA: Project Management Institute.

Salim, R. N. (2023). Pengaruh analisis arus kas dalam proyek konstruksi: Tinjauan literatur sistematis. *Journal of Sustainable Construction, 3*(1), 32–40. https://doi.org/10.26593/josc.v3i1.6961

Soeharto, I. (1997). *Manajemen proyek: Dari konseptual sampai operasional*. Jakarta: Erlangga.

Terry, G. R. (2005). *Principles of management*. New York: Alexander Hamilton Institute.

Widiasanti, I., & Lenggogeni. (2013). *Manajemen konstruksi* (Edisi revisi, P. Latifah, Ed.). Bandung: PT Remaja Rosdakarya.