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Cost and Time Analysis for the Elevation and Relocation of the Sutt Tower in the Ancol Timur – Pluit Toll Road Project

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Abstract: The construction of the Ancol Timur – Pluit Toll Road as part of a national strategic project in Jakarta faces technical challenges in the form of the presence of High Voltage Transmission Towers (SUTT) that interfere with the construction route. This study aims to analyze the cost and time required to elevate and relocate the SUTT towers, as well as evaluate their efficiency in terms of project management. The study employs cost analysis methods using the BOW, SNI, and AHSP approaches, along with scheduling techniques such as Bar Chart, CPM, and PERT. The results indicate relatively close cost estimates across methods but variations in implementation duration among scheduling methods. Project efficiency is determined by the accuracy of estimates, inter-sectoral coordination, and the utilization of construction technology. These findings are expected to provide practical contributions to the implementation of similar infrastructure projects and serve as an academic reference in construction management.

Keywords: SUTT Tower Relocation, Ancol–Pluit Toll Road, Cost Analysis, Project Scheduling, CPM, PERT, AHSP.

INTRODUCTION

Infrastructure development in Indonesia is one of the main focuses that must be done to improve economic growth, competitiveness, and connectivity between regions. To realize connectivity from Sabang to Merauke, the Ministry of Public Works and Public Housing together with several other ministries are spurring regional system-based infrastructure development. Infrastructure development is the focus of the RPJMN, which is one of the pillars of Advanced Indonesia. Indonesia Maju envisions equitable distribution of economic development. With infrastructure development, it is expected that cut off areas can be connected with cheap transportation systems and accessibility can be raised. One example is the Ancol Timur - Pluit Toll Road Project.

The elevation and relocation of existing SUTT and telecommunication towers on site throughout the project involves civil, structural and electrical works, and inter-agency coordination with PLN, districts and a number of other relevant stakeholders and must also be done without harming the community. The relocation of SUTT towers is an expensive

procedure and involves significant costs because the process must involve expertise in accordance with construction standards. Hence the need for efficient timing to avoid financial implications on the contractor and/or project owner.

In the context of construction project management, implementation efficiency and effectiveness have a close relationship with the use of resources (time, energy, cost) in a more optimal manner. In line with the notion of efficiency, effectiveness is related to the success or failure of a planned goal. Therefore, the relocation of the SUTT Tower requires in-depth analysis so that the implementation can be efficient in terms of time and cost. This research specifically reviews the cost and time of the SUTT Tower elevation and relocation work to be very relevant. In this study, the most dominant parts of the cost, the duration of implementation, and whether or not the implementation is effective when compared to the extent of the initial planning will be known. Furthermore, the information from this research is expected to be useful for project implementers or consultants who will work on projects in the form of relocation and elevation of these utilities.

The research is also expected to contribute alternative solutions or optimization in the development of construction management science, especially cost and time analysis regarding the relocation of the SUTT Tower on the Ancol route through the Ancol Pluit Toll Gate. Relocation activities and adjustments to utility infrastructure often occur in Jakarta. The cost and time efficiency analysis in this research is also expected to provide an overview for the enactment of alternative patterns of waste or cost inefficiency that can be developed even though they are not completely equalized. This means that appreciators such as the government, contractors, and consultants are expected to be informed of inefficient patterns that can be immediately avoided, as well as recommendations for their improvement, the recommendations of this research being preliminary technical quality review, cross-sector coordination, and the use of the latest construction technology.

With this background, the research on “Cost and Time Analysis of SUTT Tower Elevation and Relocation in Ancol Timur - Pluit Expressway Project” is very important to be conducted. It is desirable that the results of this study are not only practically useful for the implementation of the current project, but also contribute to the scientific literature and national construction management practices in facing similar challenges in the future.

RESEARCH METHOD

This research uses a quantitative approach with analytical descriptive method. The quantitative approach was chosen because this research focuses on collecting and processing numerical data to analyze cost and time efficiency in the implementation of the High Voltage Air Line (SUTT) tower relocation and elevation project. The numerical data used includes the volume of work, unit price, duration of construction activities, and allocation of resources used during the implementation process. The combination of descriptive and analytical methods allows the preparation of conclusions that are not only informative, but also evaluative, so that the research results can be used as recommendations for improvement in similar projects in the future.

Data Source

Primary data was obtained directly from the field using structured and semi-structured interviews with various parties involved in the project to obtain information related to the flow of project implementation, decision making, obstacles faced in the field, and problem-solving strategies.

Secondary data was obtained from various relevant documents and literature such as project documents, technical regulations, academic literature, and government policy documents.

Data Analysis

The data analysis process began with processing data from interviews, field observations, and project documentation, which were then processed using quantitative and qualitative analysis techniques. The analysis stage involved three main steps, namely descriptive analysis, cost analysis, and time analysis.

RESULTS AND DISCUSSION

The elevation and relocation work of the High Voltage Air Line (SUTT) Tower in the Ancol Timur - Pluit Toll Road project was carried out in response to the presence of the tower that interfered with the toll construction trajectory. Based on the implementation document, this project involves several main activities, namely:

1. Field survey and data collection,
2. Preparation of technical engineering design,

3. Construction of new foundation,
4. Demolition of old tower,
5. Erection of the new tower,
6. Conductor and ground wire stringing,
7. Testing and re-energizing.

Cost Analysis

The results of calculations using the 2008 BOW method, SNI 2011 and AHSP 2019 Cost Budget Plan obtained the following estimated cost budget results:

Tabel 1. Total Estimated Cost Budget

No.	Method	Total Estimated Cost Budget
1	BOW	Rp. 23.170.618.691
2	SNI	Rp. 22.664.274.964
3	AHSP	Rp. 23.113.974.964

Based on the results of the cost analysis between the BOW method, SNI method and AHSP method, there is a comparison of cost analysis as in the following table:

Tabel 2. Cost Budget Difference

Parameters	Method BOW	Method SNI	Method AHSP
Complete clearance of a strip of land concentric with the transmission line route 10 m left side and 10 m right side.	Rp. 15.000.000,00	Rp. 8.356.273,90	Rp. 8.356.273,90
Detail Engineering Design	**Rp. 500.000.000,00**	**Rp. 300.000.000,00**	**Rp. 450.000.000,00**

Time Analysis

A series of works/activities using the CPM method for the work of elevating and relocating the High Voltage Air Line Tower (SUTT) in the Ancol Timur - Pluit Toll Road project.

Tabel 3. Work Activities

No.	Activities	Code	Past Activities	Time (Week)
1	Contract Signature	A	-	1
2	Re-check Survey	B	A	1
3	Design	C	A	3
4	Review Design/Approval Drawing	D	C	3
5	Fabrication	E	D	6
6	Factory Test	F	E	1
7	Shipping/Transportation	G	H	1
8	Tower foundation work	H	B	5

No.	Activities	Code	Past Activities	Time (Week)
9	Tower foundation reinforcement work	I	F,H	2
10	Tower erection work	J	G	2
11	Tower reinforcement work	K	G,I	2
12	Installation/Stringing	L	J,K	3
13	Test and commissioning work	M	L	1

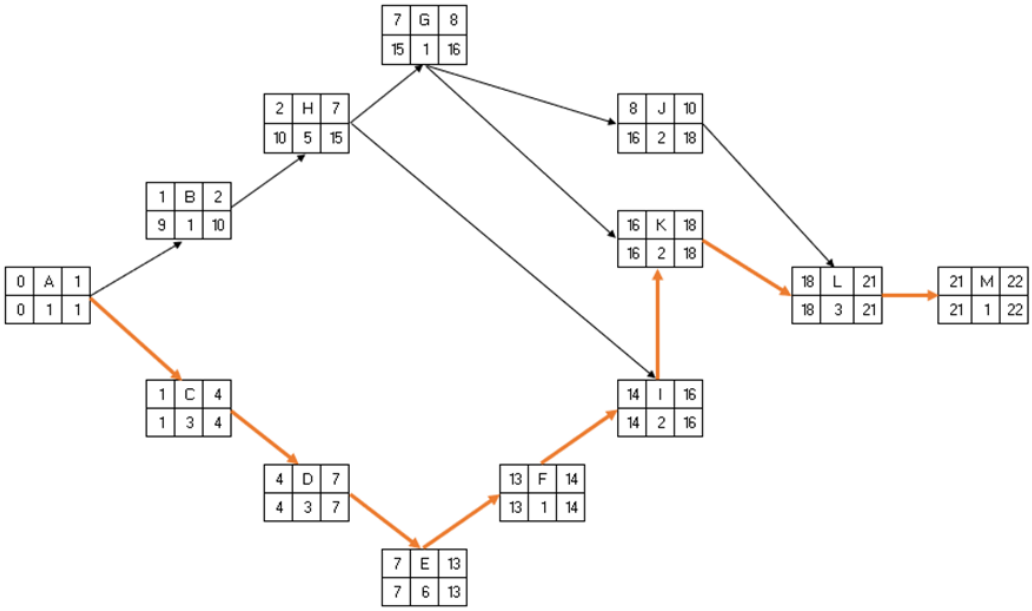

Figure 1. CPM Method Time Analysis

Based on the time analysis between the CPM method, PERT method and Barchatt method, the aspect comparison can be concluded as in the following table:

Table 4. Comparative Time Analysis

Aspects	Barchatt Method	CPM Method	PERT Method
Key Objectives	Presents a visual schedule of activities	Determine the critical path & minimum duration of the project	Estimating project time on a probabilistic basis
Time Duration Type	Deterministic	Deterministic (definite duration)	Probabilistic (optimistic, realistic, pessimistic)
Analysis Focus	Activity scheduling & time visualization	Critical path and time float	Time uncertainty & probability of finishing on time
Complexity	Low	High	Higher
Activity Representation	Beam on the time axis	Network diagram	Network diagram (with time distribution)

Aspects	Barchatt Method	CPM Method	PERT Method
Activity Dependency	Not explicit (difficult for logical connection)	Explicitly displayed	Explicitly displayed
Advantages	Easy to read and create	Identifying critical activities	Suitable for uncertain projects
Disadvantages	Does not show activity dependency	Not suitable for projects with high uncertainty	Complicated and requires accurate estimation data

CONCLUSIONS

Based on the analysis of the elevation and relocation work of the High Voltage Air Line Tower (SUTT) on the Ancol Timur - Pluit Toll Road project, it can be concluded that, the cost estimate using the AHSP method resulted in a cost of Rp 23,113,974,964, the SNI method resulted in a cost of Rp 22,664,274,964, and the BOW method of Rp 23,170,618,691. This shows that in general, the project cost requirements are in the range of Rp 22.66 billion - Rp 23.17 billion. Project scheduling was analyzed using three methods, namely Bar Chart (estimated time: 24 weeks), Critical Path Method (estimated time: 22 weeks), and Program Evaluation and Review Technique (estimated time: 35 weeks). When combined, the combination of the CPM method for scheduling and the SNI method for cost estimation can be considered as the most efficient and rational approach in the implementation of this project, while still paying attention to the quality of results and risk mitigation.

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