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VALUE ENGINEERING AT THE CULTURAL HERITAGE BUILDING RESTORATION SITE A.A. MARAMIS – AT JAKARTA

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Abstract

With the rapid development and construction of high-rise buildings, especially in Jakarta, the restoration of heritage buildings like the A.A. Maramis building has become increasingly important. This study aims to apply Value Engineering (VE) principles to the restoration of heritage buildings, specifically to reduce restoration costs. Heritage buildings are invaluable cultural assets that must be preserved. The restoration process often requires the use of materials that match the original characteristics of the building, such as porous plaster. However, these materials can be expensive. This study seeks to identify alternative materials that can reduce costs without compromising the quality of the restoration work. By employing a quantitative-qualitative approach using the Pareto method, Function Analysis System Technique (FAST), Life Cycle Cost (LCC), and Multi-Criteria Analysis (MCA), this research aims to find the most cost-effective solution while maintaining the building's original character. Primary data was collected from field observations, material comparisons, and expert questionnaires to assess the suitability of alternative materials.

INTRODUCTION

Originally named after Alexander Andries Maramis, the construction of this heritage building began in 1809, initiated by the Governor-General of the Dutch East Indies, Herman Willem Daendels. The intention was to relocate the increasingly dilapidated Batavia Palace from the mouth of the Ciliwung River to a new area in Weltevreden, south of Batavia. The building was officially inaugurated in 1828 by Commissioner-General L.P.J. Du Bus de Ghisignies and served as the headquarters for the state treasury and other important government agencies from 1828 to 1942, during the Japanese occupation of Indonesia and subsequently during the Indonesian Revolution of 1945-1949. The building was eventually handed over to the Republic of Indonesia in 1950 and continued to be used as the office of the Indonesian Ministry of Finance. Gedung cagar budaya A.A. Maramis adalah banguna cagar budaya yang harus di lestarikan. Karena pentingnya bangun bersejarah bagi identitas negara khususnya Indonesia, Penulis tertarik untuk mengambil tesis Value Engineering (VE) pada bangun cagar budaya dengan menganalisis pada pemugaran gedung cagar budaya ini Penulis membagi informasi dari hasil pengalaman untuk bahan alternatif dalam pemugaran cagar budaya melalui tahapan *Value Engineering (VE)* ini mempunyai gambaran dalam mengefisienkan biaya produksi pekerjaan pemugaran pada bangunan cagar budaya, efisiensi ini dapat dilakukan juga pada bangunan cagar budaya lain di Indonesia khususnya di DKI Jakarta yang masih banyak banguna cagar budaya yang harus di lestarikan dengan biaya produksi yang dapat diturunkan. *Value Engineering (VE)* adalah mengurangi biaya produksi bukan mengurangi kualitas produksi yang dihasilkan.

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With over 2,876 heritage buildings in Indonesia, particularly nearly 1,000 in Jakarta, there is a significant market opportunity for investors to develop and produce building materials that meet the specific needs of heritage building restoration. The demand for materials like teak, hardware, and especially specialized plaster is high due to the unique characteristics of these historic structures.

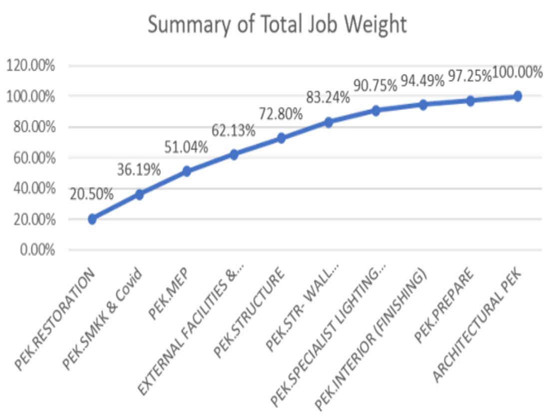
RESEARCH METHODOLOGY

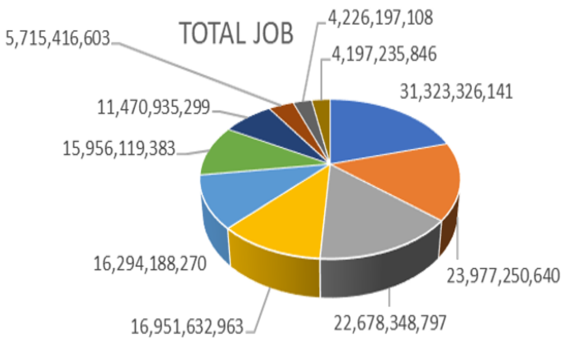
This thesis employs a quantitative research method to apply Value Engineering (VE) as a comparative tool for materials used in the project. The data collected will be used to evaluate the materials in terms of Cost, Quality, and Time (CQT).

To complement the quantitative research, the author also employed additional Value Engineering (VE) stages to achieve cost savings in the heritage building restoration project. The VE process followed these stages: Information, Function Analysis, Creativity, Evaluation, Development, Presentation, and Recommendation. To further enhance these stages, the study utilized the Pareto method, Cost Model, FAST Diagram, Creativity techniques, Life Cycle Cost (LCC), and Multi-Criteria Analysis (MCA).

***Metode Pareto* (Two Stages):**

No	Work Items	Total Job	Weight	Commulative Weight
1	PEK.RESTORATION	31,323,326,141	20.50%	20.50%
2	PEK.SMKK & Covid	23,977,250,640	15.69%	36.19%
3	PEK.MEP	22,678,348,797	14.84%	51.04%
4	EXTERNAL FACILITIES & CHANNELS PEK	16,951,632,963	11.09%	62.13%
5	PEK.STRUCTURE	16,294,188,270	10.66%	72.80%
6	PEK.STR- WALL REINFORCEMENT	15,956,119,383	10.44%	83.24%
7	PEK.SPECIALIST LIGHTING (int&ex)	11,470,935,299	7.51%	90.75%
8	PEK.INTERIOR (FINISHING)	5,715,416,603	3.74%	94.49%
9	PEK.PREPARE	4,226,197,108	2.77%	97.25%
10	ARCHITECTURAL PEK	4,197,235,846	2.76%	100.00%
		152,790,651,050	100.00%	





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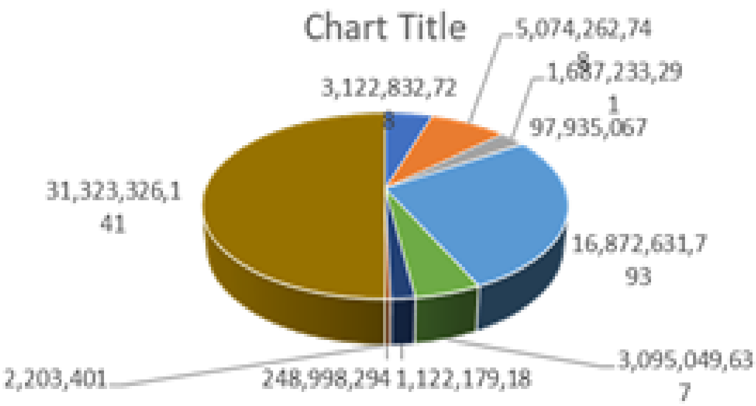
No.	Work Items	Total Job	Weight	Commulative Weight
	Restoration Work			
1	Demolation Work	3,122,832,728	9.97%	9.97%
2	Roofing Work	5,074,262,748	16.20%	26.17%
3	Ceiling Work	1,687,233,291	5.39%	31.56%
4	Wall and Partition work	97,935,067	0.31%	31.87%
5	Wall Finishing Work	16,872,631,793	53.87%	85.73%
6	Door and Window Work	3,095,049,637	9.88%	95.62%
7	Floor Finishing Work	1,122,179,182	3.58%	99.20%
8	Household Work and Finishing	248,998,294	0.79%	99.99%
9	Miscellaneous Work	2,203,401	0.01%	100.00%
	Total Restoration Work	**31,323,326,141**	100.00%	



Cost Model (Existing and alternative materials 1, 2, and 3)

No	Work Items	Unit	Volume	Unit Price	Total Price
	Wall Construction Completion				
1	Work Plastering and Plastering existing walls	m2	1,894	*602,438*	1,141,017,572
2	Work Plastering and Plastering on columns, Pilasters and Ornaments	m2	3,295	*602,438*	1,985,033,210
3	Work Plastering and Plastering existing walls (inside)	m2	19,068	*602,438*	11,487,287,784
4	Work Plaster Wall Finishing (Outside and Inside)	m2	24,257	93,140	2,259,296,980
	Total Wall Completion Work:				16,872,634,388

No	Work Items	Unit	Volume	Unit Price	Total Price
	Wall Construction Completion				
1	Work Plastering and Plastering existing walls	m2	1,894	356,800	675,779,200
2	Work Plastering and Plastering on columns, Pilasters and Ornaments	m2	3,295	356,800	1,175,656,000
3	Work Plastering and Plastering existing walls (inside)	m2	19,068	356,800	6,803,462,400
4	Work Plaster Wall Finishing (Outside and Inside)	m2	24,257	93,140	2,259,296,980
	Total Wall Completion Work:				10,914,193,422

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No	Work Items	Unit	Volume	Unit Price	Total Price
	Wall Construction Completion				
1	Work Plastering and Plastering existing walls	m2	1,894	*438,900*	831,276,600
2	Work Plastering and Plastering on columns, Pilasters and Ornaments	m2	3,295	*438,900*	1,446,175,500
3	Work Plastering and Plastering existing walls (inside)	m2	19,068	*438,900*	8,368,945,200
4	Work Plaster Wall Finishing (Outside and Inside)	m2	24,257	93,140	2,259,296,980
	Total Wall Completion Work:				12,905,693,122

No	Work Items	Unit	Volume	Unit Price	Total Price
	Wall Construction Completion				
1	Work Plastering and Plastering existing walls	m2	1,894	*383,300*	725,970,200
2	Work Plastering and Plastering on columns, Pilasters and Ornaments	m2	3,295	*383,300*	1,262,973,500
3	Work Plastering and Plastering existing walls (inside)	m2	19,068	*383,300*	7,308,764,400
4	Work Plaster Wall Finishing (Outside and Inside)	m2	24,257	93,140	2,259,296,980
	Total Wall Completion Work:				11,557,003,922

No	Work Items	Unit	Volume	Unit Price	Total Price
	Wall Completion Work				
1	Material Sample	Eksisting	Alternaif 1	Alternaif 2	Alternaif 3
2	Price/m2 Material (24.257m2)	602,438	356,800	*438,900*	383,300
3	Total Cost of Plastering Work	16,872,634,387	10,914,193,422	*12,905,693,122*	11,557,003,922
4	Cost Efficiency	0	5,958,440,965	3,966,941,265	5,315,630,465

No	Excess	Special Mortar Products for Cultural Heritage			
		Porosan Trassanierputz Np	UZIN Sc 75 WDS	EP 64 Putih	(1PC:3PS:3Kapur+Cat Prefabricated)PC Type 1
		Bahan Eksisting	Alternatif 1	Alternatif 2	Alternatif 3
1	Row Material	Component	Component	Component	Primary Material
2	Job application	Readily applicable material	Readily applicable material	Readily applicable material	Readily applicable material
3	Application drying	24-hour time	10-hour time	24-hour time	24-hour time
4	Size of sand grains	Halus (0-1 mm)	Halus (0-1 mm)	Halus (0-1 mm)	Kasar (1-2 mm)
5	How the product works	"Salt and moisture are absorbed by the plaster, causing it to deteriorate. Once saturated, the plaster must be removed to prevent further damage."	"Through electrolysis, the solution releases water and salt ions, which are then converted into water vapor	"Salt and moisture are absorbed by the plaster, causing it to deteriorate. Once saturated, the	Extreme weather resistant

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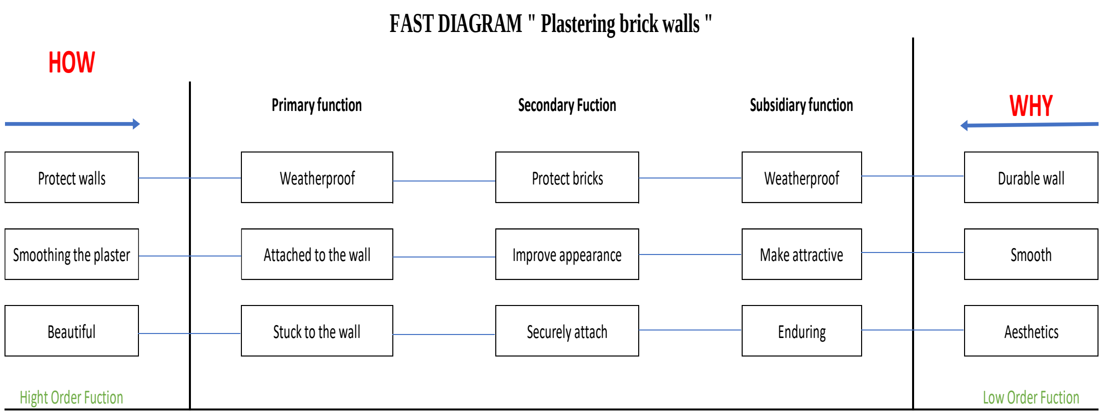
			and electrolytes."	plaster must be removed to prevent further damage."	
6	Product Guarantee	5-year warranty,	5-year warranty,	-	1-year warranty,
7	Against project weather	Durable	Durable	Durable	Durable

No	Shortage	Produk Mortar Khusus Cagar Budaya			
		Porosan Trassanierputz Np	UZIN Heritage Plaster	EP 64 Putih	Type 1PC:3PS:3Kapur + Cat Prefabricated
		Exsisting Material	Alternative 1	Alternative 2	Alternative 3
1	Factory location	Jerman	Indonesia	Jerman	Indonesi
2	Price / m2	602,438	356,800	438,900	383,300
3	Price (Expensive > Rp.200.000)	Expensive	Expensive	Expensive	Expensive
4	Delivery of materials	long in delivery (>30 days)	long in delivery (>7 days)	long in delivery (>30 days)	long in delivery (>7 days)
5	Expert Intern	Experts do not always monitor	Experts do not always monitor	Do Not	Experts do not always monitor
6	Storage Warehouse	must exist	must exist	must exist	must exist
7	Raw material	TKDN <50%	TKDN >50%	TKDN <50%	TKDN >50%
8	In the product Application	high temperature	high temperature	high temperature	high temperature
9	Mixture of Ingredients	in factory	in factory	in factory	Not in factory
10	Drying time in a humid room	10-hour time	5-hour time	10-hour time	10-hour time

Functional Analysis System Technique Diagram (Fast Diagram)



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Creatifity, Life Cycle Cost (LCC)

Cost Item	Life Cycle Cost (Rp)			
	Exsisting / Orginal	Alternative 1	Alternative f 2	Alternative 3
Planned Age (LCC)	50 Tahun	50 Tahun	50 Tahun	50 Tahun
interest rate (i)	9.00%	9.00%	9.00%	9.00%
Initial Cost (Consrtuction Cost)	Rp16,872,634,387	Rp10,914,193,422	Rp12,905,693,122	Rp11,557,003,922
Operational and Maintenance	Rp0.00	Rp0	Rp0	Rp0
Replacement Cost	Rp2,503,108,946	Rp1,619,155,288	Rp1,756,514,311	Rp9,614,658,237
Salvage Value	Rp19,375,743,333	Rp12,533,348,710	Rp14,662,207,433	Rp21,171,662,159
Total Present Worth Life Cycle Cost	Rp19,375,743,333	Rp12,533,348,710	Rp14,662,207,433	Rp21,171,662,159
Life Cycle Cost Saving		Rp6,842,394,623	Rp4,713,535,900	Rp1,795,918,826
Prosentase Life Cycle Saving to the total Original Cost		35.31%	24.33%	9%
Total Present Worth Construstion Cost	Rp16,872,634,387	Rp10,914,193,422	Rp12,905,693,122	Rp11,557,003,922
Construction Cost Saving		Rp5,958,440,965	Rp3,966,941,265	Rp5,315,630,465
Prosentase		35.31%	23.51%	31.50%

Multi Criteria Analysis (MCA)

Assessment Items	Weight Ranking	Expert 1	Expert 2	Expert 3	Average
Cost	20-25	25.00	25.00	20.00	25.00
Durability	20-25	20.00	15.00	20.00	20.00
Job application	15-20	10.00	10.00	15.00	10.00
Factory location	15-20	10.00	15.00	10.00	10.00
Raw material	15-20	15.00	15.00	15.00	15.00
Periodic Maintenance	20-25	20.00	20.00	20.00	20.00

Work Items	Porosan Trassanierputz Np	Plesteran type SC 75 WDS	EP 64 Putih	1PC:3PS+3Kapur+ Cat Prefabricated
Material Prices	602,438	356,800	438,900	383,300
Compressive Strength	CS II : 1,5 - 5 N/mm² (15,3 - 51 Kg/cm²)	CS IV : ≥ 6 N/mm2 (≥ 61 Kg/cm²)	Kekuatan mortar 4-5 N/mm2	Kekuatan mortar 1.5-4 N/mm2
	4 N/mm2	7 N/mm2	4 N/m2	3 N/m2
Job application	Easy	Easy	Easy	Easy
Factory location	Foreign country	Domestic	Foreign country	Domestic
Component	Factory processing	Factory processing	Factory processing	Manual processing
Raw material	Volcanic ash, lime stone, sand, Cement Portland, Additive	Cemen OPC, sand Silika, additive	Pengikat mineral, sand kuarsa	Cement Portland, Sand silika, lime stone (Ca(OH)2) + Custom-made paint
Periodic Maintenance	25 years	25 years	25 years	10 years
Self-processed data				

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Item Penilaian	Weight	Exsisting	Weight	Alt.1	Weight	Alt.2	Weight	Alt.3	Weight
Cost	25.00	2.00	50.00	3.00	75.00	3.00	75.00	3.00	75.00
Compressive Strength	20.00	2.00	40.00	3.00	60.00	2.00	40.00	1.00	20.00
Job application	10.00	2.00	20.00	2.00	20.00	2.00	20.00	1.00	10.00
Factory location	10.00	2.00	20.00	3.00	30.00	2.00	20.00	3.00	30.00
Raw material	15.00	2.00	30.00	3.00	45.00	2.00	30.00	3.00	45.00
Periodic Maintenance	20.00	2.00	40.00	2.00	40.00	2.00	40.00	1.00	20.00
Amount			200.00		270.00		225.00		200.00

Item Bobot	Weight	Exsisting	Weight	Alt.1	Weight	Alt.2	Weight	Alt.3	Weight
Cost	25.00	1.00	25.00	1.50	37.50	1.50	37.50	1.50	37.50
Compressive Strength	20.00	1.00	20.00	1.50	30.00	1.00	20.00	0.50	10.00
Job application	10.00	1.00	10.00	1.00	10.00	1.00	10.00	0.50	.00
Factory location	10.00	1.00	10.00	1.50	15.00	1.00	10.00	1.50	15.00
Raw material	15.00	1.00	15.00	1.50	22.50	1.00	15.00	1.50	22.50
Periodic Maintenance	20.00	1.00	20.00	1.00	20.00	1.00	20.00	0.50	10.00
Amount			100.00		135.00		112.50		100.00

DISCUSSION RESULTS

Arifin, Hafidz Putra. "Legal Politics of Cultural Heritage Protection in Indonesia." Dialogia Iuridica: Journal of Business and Investment Law 10.1 (2018): 65-76.

Arifin, Hafidz Putra. "Legal Politics of Cultural Heritage Protection in Indonesia." Dialogia Iuridica: Journal of Business and Investment Law 10.1 (2018): 65-76. Kusumowardani, Dian, and Tri Wahyuni. "The Importance of Preparation in the Conservation Process of Cultural Heritage Sites and Buildings." Journal of Innovation Research and Knowledge 4.1 (2024): 349-362.

The implementation of a heritage conservation project typically involves three stages: preparation, planning (including permits), and execution (including monitoring and control). In the process of conserving heritage sites, buildings, and structures, project teams often overlook the crucial role of the preparation stage, which serves as the foundation for technical planning, construction, and long-term utilization. This neglect frequently leads to problems during the overall conservation process, particularly in terms of technical planning and construction.

During World War II, from 1939 to 1945, the concept of Value Engineering (VE) began to take shape. The rapid advancement of military technology presented significant challenges for General Electric in meeting the escalating demands for armaments. Faced with severe material shortages, Lawrence Miles, a process engineer at GE, developed a new approach. Based on a functional perspective, he posed the question: "If I cannot achieve the product, how can I achieve the function using alternative available materials?"

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According to M. Ali Berawi, value engineering is a quality methodology applied to projects to enhance value. Also known as value engineering, it is a cost control method with significant potential for success due to its application of value analysis to benefits. It ensures the desired quality and durability while minimizing costs as much as possible (Soekarno, 2001 in Hafifuddin, 2015).

Method for reducing production budgets without compromising quality or function importance. The goal of value engineering is to increase profits without incur additional costs; this can be achieved by maintaining profits, by using both, or by a combination of both.

Despite the many benefits of Value Engineering (VE) for construction projects, one of the greatest benefits is the ability to increase the competitiveness of the construction industry in several countries. One of the biggest benefits is the ability of Value Engineering (VE) to work out the correct planning conclusions during the design phase. Planning decisions make building designs more efficient. (Robinson, 2008).

The opinion of Kelly et al. (2004), value is very closely related to Cost, Quality and Time, explaining the relationship between funds, time and quality. Quality consists of several variables that are determined from the knowledge and expertise of several individuals in the group. Quality is structured explicitly with many objectives in selecting those that are suitable for benefits (Berawi, 2013). Brick wall work in buildings is a construction process that involves arranging and bonding bricks with mortar to form structural or non-structural walls that fulfill the mechanical, aesthetic and protective functions of the building. The Functions and Benefits of Brick Walls are Structural: Provides structural support for buildings, Partition: Divides space within a building, Insulation: Provides thermal and acoustic insulation, Security: Provides protection against fire and external weather conditions. The walls consist of bricks, speci or a mixture of cement and sand, using mixing tools such as cement spoons and hoes.

CONCLUSION

The aim of Value Engineering (VE) in cultural heritage buildings A.A. Maramis is to reduce production costs in the restoration of this building, especially wall plastering work with special materials because with the Value Engineering (VE) stage the resulting reduction is in production costs, speeding up production and maintaining the quality produced. The Pareto method finds work that can be cost efficient, namely plastering work with a total work cost of IDR 16,872,634,387 (Sixteen billion eight hundred seventy-two million six hundred thirty-four thousand three hundred eighty-seven rupiah) with existing materials, the resulting costs with alternative material 1 amounting to IDR 10,914,193,422 (Ten billion nine hundred fourteen million one hundred ninety three thousand four hundred twenty two rupiah) so it can streamline the total cost of plastering work of IDR 5,958,440,965 (Five billion nine hundred and fifty eight million four hundred forty thousand nine hundred and sixty five rupiah) or 35%. The cost model obtains alternative materials other than the price of existing materials with Unit Price Analysis for each material as a basic reference price for calculations, namely existing materials amounting to IDR 602,438/m2, Alternative material 1 amounting to IDR 356,800/m2, Alternative material 2 amounting to IDR 438,900/m2, Material alternative 3 is IDR 383,300/m2.

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Function Analysis System Technique Diagram (FAST) provides an analysis of the function of pleater work, namely as a wall protector from external weather, from an aesthetic perspective the walls can become more beautiful by finishing on them using other finishes (ceramics, wall paper, etc.).

Life Cycle Cost (LCC) gets savings costs during work with interest rates that apply in 2024, costs during the maintenance period, costs for replacing work after 50 years.

Cost Item	**Life Cycle Cost (Rp)**			
	Exsisting / Orginal	**Alternative 1**	**Alternative 2**	**Alternative 3**
Planned Age (LCC)	50 years	50 years	50 years	50 years
interest rate (i)	9.00%	9.00%	9.00%	9.00%
Initial Cost (Consrtuction Cost)	Rp16,872,634,387	Rp10,914,193,422	Rp12,905,693,122	Rp11,557,003,922
Operational and Maintenance	Rp0.00	Rp0	Rp0	Rp0
Replacement Cost	Rp2,503,108,946	Rp1,619,155,288	Rp1,756,514,311	Rp9,614,658,237
Salvage Value	Rp19,375,743,333	Rp12,533,348,710	Rp14,662,207,433	Rp21,171,662,159
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Construction Cost Saving	0	Rp5,958,440,965	Rp3,966,941,265	Rp5,315,630,465
Prosentase	0	35.31%	23.51%	31.50%
Self-processed data				

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