BULLETIN OF ENGINEERING SCIENCE, TECHNOLOGY AND INDUSTRY
(BESTI Journal) | ISSN(e): 3025-5821
Website: https://bestijournal.org/index.php/go/index | Volume 4 No. 4 (2026)

COST PLANNING FOR THE BUKIT MAS-KUBANGAN TOMPEK ROAD PRESERVATION PROJECT USING AHSP BINA MARGA 2025

Ilham Effendi Siregar*[1], Asri Afriliany Surbakti[2], Lisherly Reginancy Debataraja[3], Rhini Wulan Dary[4]
[1,2,3,4]Road and Bridge Design Engineering Study Program, Department of Civil Engineering
Politeknik Negeri Medan, Medan, Indonesia
E-mail: siregarilham173@gmail.com

Received: 06/09/2026 | **Revised:** 11/09/2026 | **Accepted:** 30/09/2026 | **Published:** 29/10/2026

Abstract

Accurate cost planning is essential for road preservation because work quantities, resource prices, and analytical coefficients determine the required budget. This study examines the Bukit Mas-Kubangan Tompek Road Preservation Project in Mandailing Natal Regency, North Sumatra, using the AHSP Bina Marga 2025 method. A quantitative approach combined project drawings, the previous project budget, local material and labor prices, equipment cost data, and relevant price schedules. The analysis comprised quantity takeoff, resource-based unit price analysis, budget compilation, and comparison with the previous planning document. The thesis reports a total estimate of IDR 17,312,745,239.00, compared with IDR 15,274,208,632.00 in the previous document, and a reported difference of IDR 2,038,536,606.00, or 13.35%. Asphalt pavement contributed the largest upward cost difference, while drainage and granular pavement recorded lower divisional estimates. The analysis associates these differences with resource price references, AHSP coefficients, equipment and labor productivity, and calculated quantities. The findings emphasize careful quantity verification and transparent unit price documentation. Numerical inconsistencies between some source tables remain unresolved; the reported totals are therefore presented as thesis findings rather than an independently reconciled bill of quantities.

Keywords: AHSP Bina Marga; Cost estimation; Road preservation; Unit price analysis; Work quantities.

INTRODUCTION

Road preservation maintains the function and service life of an existing road through maintenance, rehabilitation, reconstruction, and preventive treatment. In the source study, preservation is understood as both a technical activity and a budgeting problem: the required treatment must be translated into quantities, resource requirements, and a defensible estimate before implementation. A road budget consequently depends on the consistency of the drawings, the selected construction methods, and the prices assigned to labor, materials, and equipment (Siregar, 2026).

The Bukit Mas-Kubangan Tompek Road Preservation Project provides a specific setting for examining this relationship. The road is located in Mandailing Natal Regency, North Sumatra, and serves settlements and plantation areas. The project documentation describes an intervention intended to maintain and improve road serviceability. Its scope combines earthworks, drainage, aggregate layers, asphalt pavement, structural works, and ancillary activities, which require different resources and therefore cannot be represented adequately by a single undifferentiated construction rate (Siregar, 2026).

The study applies AHSP Bina Marga 2025, the unit price analysis reference used in the thesis, to estimate these work items and compare the resulting budget with the previous planning document. The comparison focuses on the size and direction of the reported difference and on the factors identified in the cost analysis, rather than on observed expenditure during construction (Kementerian Pekerjaan Umum dan Perumahan Rakyat [PUPR], 2025; Siregar, 2026). The research has three objectives: to establish work quantities and the total project cost estimate, to compare the AHSP Bina Marga 2025 estimate with the previous budget, and to identify factors associated with the difference. The scope follows the project planning documents and excludes construction scheduling, implementation

management, and expenditure control. An estimate-to-estimate difference does not itself demonstrate a realized project cost overrun (Siregar, 2026).

LITERATURE REVIEW

Cost planning and the project budget

A project cost estimate, or Rencana Anggaran Biaya (RAB), expresses the financial requirements of a defined construction scope. Mukomoko (1987) describes budget preparation in relation to drawings, work descriptions, wage schedules, material prices, and detailed cost analysis. The thesis applies this item-based approach by calculating quantities and assigning a unit price to each work item. The resulting item costs are then grouped by work division to produce an overall estimate. This organization makes the relationship between the physical work and the proposed expenditure explicit.

The construction management framework discussed in the thesis places estimation within project planning. Resource requirements must be identified before individual costs can be aggregated into a budget. In this framework, the estimate provides a reference for subsequent decisions, but its usefulness depends on the quality and consistency of the underlying information. Project Management Institute (2021) provides the project management reference used by the thesis, while Bachtiar (2007) supports its discussion of detailed construction cost estimation. The present study uses these concepts to organize the calculation, not to evaluate schedule performance.

AHSP, resource coefficients, and equipment productivity

Analisis Harga Satuan Pekerjaan (AHSP) separates a work item into labor, material, and equipment requirements. Each component is represented by a coefficient and a basic resource price. The coefficient describes the resource quantity required to produce one payment unit, whereas the basic price assigns a monetary value to that resource. Multiplying and summing these components produces the direct unit cost; the allowance for overhead and profit is then incorporated into the work-item rate. This structure is the central analytical basis of the thesis (PUPR, 2025; Siregar, 2026).

Equipment cost analysis links operating time with productive output. The thesis distinguishes ownership-related costs from operating costs, including fuel, lubricants, maintenance, repairs, and operator wages. It also considers capacity, cycle time, and efficiency when determining equipment coefficients. The equipment functions described in Katalog Alat Berat (2013), together with the AHSP reference, support the selection of excavators, trucks, graders, rollers, and asphalt production equipment. Consequently, the hourly cost of an item of equipment and its cost per unit of completed work represent different quantities (PUPR, 2025).

Previous road cost estimation studies

Gafar and Dzinnur (2022), as reviewed in the thesis, compared AHSP 2016 and AHSP 2022 for the Surabaya-Sidoarjo road preservation project. The review reports a 21.83% difference and a lower estimate under AHSP 2016. Riwibowo et al. (2023) examined AC-BC and AC-WC work using AHSP SNI 2016 and Bina Marga 2020, identifying differences associated with labor, material, and equipment coefficients. These studies provide a basis for comparing estimation references, although their findings concern their own project conditions and cannot be transferred directly to Bukit Mas-Kubangan Tompek.

Zulfansyah et al. (2022) compared an engineer's estimate with AHSP Bina Marga for periodic road maintenance at Paya Bakong Cluster IV. Oktaviani et al. (2025) applied AHSP to the Jalan Parit Demang improvement project, with a reported estimate of IDR 15,754,053,157. The present study applies AHSP Bina Marga 2025 to recalculated quantities and compares the result with one project's previous budget. Its contribution is a project-specific comparison, not evidence that one AHSP edition always produces higher or more accurate costs (Siregar, 2026).

OPEN ACCESS

METHOD

Research design and project setting

The research employed a quantitative approach based on quantity takeoff, unit price analysis, and budget comparison. The unit of examination was the Bukit Mas-Kubangan Tompek Road Preservation Project, rather than a sample of separate projects or a questionnaire-based population. The site was in Wonosari, Sinunukan District, Mandailing Natal Regency, North Sumatra, at the coordinates reported in the thesis: 0°30′39.0″ N and 99°15′52.0″ E. Table 1 summarizes the administrative information supplied by PT. Budi Karya Indah (Siregar, 2026).

Table 1. Project information reported in the thesis

Attribute	Project information
Project	Bukit Mas-Kubangan Tompek Road Preservation
Contract number	05/KTR-APBN/Bb2-Wil.s3.4/2025
Owner and funding	Ministry of Public Works; national budget (APBN)
Previous contract/planning value	IDR 15,274,208,632.00
Contractor	PT. Budi Karya Indah
Supervision consultant	PT. Daksinapati Karsa Konsultindo KSO
Reported project length	3.5 km; STA 0+000 to STA 3+500
Contract arrangement	Lump sum
Implementation and maintenance	180 and 365 calendar days, respectively

Source: Siregar (2026), thesis Table 3.1 and Section 3.2; original project data attributed to PT. Budi Karya Indah.

Image 1 shows the alignment used to describe the project setting. The thesis characterizes the terrain as a combination of relatively level and hilly areas, providing context for the construction and equipment assumptions used in the estimate (Siregar, 2026).



Image 1. Location of the Bukit Mas-Kubangan Tompek Road Preservation Project.

Source: Google Earth map reproduced in Siregar (2026), thesis Figure 3.2. Original map labels retained.

Data sources and collection

The thesis classifies project drawings, detailed engineering design information, and the previous budget recap as secondary data. Material prices, wage information, and equipment cost inputs were compiled from the project location, interviews concerning the prices used, and the North Sumatra 2025 price references identified in the thesis. The analysis also used the AHSP Bina Marga 2025 guidance and relevant construction literature. No additional field data were collected for this article; its numerical evidence is drawn from the supplied thesis (Siregar, 2026).

OPEN ACCESS

Analytical procedure and calculation basis

The analytical sequence followed the research flow in the thesis: literature review and problem formulation; collection of project and price data; calculation of work quantities; unit price analysis; item and divisional budget compilation; comparison with the previous budget; and identification of factors associated with the difference. Drawings established the geometry, while basic resource prices and AHSP coefficients established the monetary requirements. This sequence connects the reported results with their underlying inputs (Siregar, 2026).

For work of uniform width and thickness, quantity takeoff used the length, width, and thickness or depth shown in the calculation. For work with varying cross-sections, the thesis calculated sectional areas and accumulated quantities by station. Asphalt mixture quantities were converted from geometric volume to mass using the density stated for the relevant mixture. The principal relationships used in this article to express the thesis procedure are summarized below; symbols and units are listed before the references.

$$V = L \times b \times t \tag{1}$$

$$M = V \times \rho \tag{2}$$

In Equations (1) and (2), V is the geometric volume, L is length, b is width, t is thickness or depth, M is material mass, and ρ is mixture density. These relationships explain why the unit of a pay item must be maintained consistently: aggregate layers are presented in cubic meters, asphalt concrete in tonnes, and surface-related work in square meters or liters, as applicable. A quantity expressed in one unit cannot be multiplied directly by a rate expressed in another (Siregar, 2026).

$$D = \Sigma(kL \times pL) + \Sigma(kM \times pM) + \Sigma(kE \times pE) \tag{3}$$

$$H = D + O; \quad C = V \times H \tag{4}$$

Equation (3) represents the direct unit cost D as the sum of labor, material, and equipment components. Each k is a resource coefficient and each p is the corresponding basic price. In Equation (4), H is the work-item unit price, O is the overhead and profit allowance, and C is the work-item cost. Here V denotes the work quantity in its applicable payment unit. The example AHSP worksheets reproduced in the thesis generally apply overhead and profit equal to 10% of direct cost (PUPR, 2025; Siregar, 2026).

$$R = \Sigma C + VAT \tag{5}$$

$$\Delta R = R2025 - Rprevious; \quad \delta = (\Delta R / Rprevious) \times 100\% \tag{6}$$

The work-item costs were grouped into the project's work divisions and combined with value-added tax (VAT) to obtain the reported total R. The source budget uses an 11% VAT calculation. This rate is retained as a feature of the original calculation, not as a statement about the tax treatment of a new contract. Equation (6) expresses the nominal and percentage differences between the two estimates; the denominator is the previous planning value (Siregar, 2026).

Treatment of the source figures

The article preserves the quantities, component rates, divisional recaps, and final conclusions reported in the thesis. Source locations are identified for the tables because some entries vary between the detailed calculations, item budgets, and final recap. The tables below therefore show reported values rather than a newly reconciled budget. Where a discrepancy affects interpretation, it is identified explicitly instead of being resolved by selecting an undocumented replacement value.

The source describes a 3.5 km project in its administrative section but uses a length of 3,900 m in several pavement quantity calculations. Both descriptions are retained in their respective contexts. The article does not assume that the difference represents an approved scope change. Similarly, the analysis does not isolate the independent monetary effect of each coefficient, price, or productivity assumption. These boundaries are carried forward into the discussion and conclusion (Siregar, 2026).

OPEN ACCESS

RESULTS AND DISCUSSION

Basic labor and material prices

The basic prices form the monetary inputs to the unit price worksheets. Table 2 reproduces the wage schedule, including the distinction between locally identified rates and the two rates described as assumptions. All values are hourly inputs. These figures are not monthly wages and are not presented as current regional wage standards; they are the prices used in the thesis calculation (Siregar, 2026).

Table 2. Basic labor prices used in the thesis

Labor category	Code	IDR/hour	Source basis
General worker	L01	29,082.00	Project location
Skilled worker	L02	31,724.00	Project location
Foreman	L03	37,185.00	Project location
Equipment operator	L04	27,000.00	Project location
Assistant operator	L05	18,000.00	Project location
Driver	L06	25,000.00	Project location
Assistant driver	L07	17,000.00	Project location
Mechanic	L08	25,000.00	Assumption in thesis
Assistant mechanic	L09	20,000.00	Assumption in thesis
Head skilled worker	L10	26,000.00	Project location

Source: Siregar (2026), thesis Table 4.1. The skilled-worker rate in this schedule differs from the IDR 31,714.00 used in several detailed worksheets.

The material schedule combines project-location prices, base-camp prices, and the North Sumatra standard price schedule identified as SSH SUMUT 2025. Table 3 presents selected entries with clearly stated units. These source categories matter because a basic material price and an installed work-item price describe different stages of the estimate. The latter includes the resource coefficients and other cost components in the relevant worksheet (Siregar, 2026).

Table 3. Selected basic material prices in the source schedule

Material	Unit	IDR/unit	Source basis
Sand for AC-WC and mortar	m³	275,000.00	Base camp
Coarse sand for concrete	m³	194,500.00	Base camp
River stone	m³	177,799.00	SSH SUMUT 2025
Coarse crushed aggregate	m³	271,629.93	Base camp
Selected fill material	m³	294,150.00	Project location
Ordinary fill material	m³	146,455.00	Project location
Bitumen	kg	24,740.00	Project location
Portland cement, 50 kg bag	bag	92,000.00	SSH SUMUT 2025
Class A aggregate	m³	294,168.56	Base camp
Class B aggregate	m³	218,926.00	Base camp
Class S aggregate	m³	213,365.29	Base camp
Plain reinforcing steel, BjTP 280	kg	23,310.00	Project location

Source: selected entries from Siregar (2026), thesis Table 4.2. Values are retained as basic-price inputs and are not substituted for rates appearing elsewhere in the thesis.

The distinction between the basic-price schedule and the detailed worksheets is relevant to the comparison. For example, aggregate, sand, and equipment entries are not identical in every table of the thesis. The article retains the source selected for each table and does not infer that these variations are verified market movements. A reconciled estimate would require confirmation of the exact price reference assigned to each work item.

OPEN ACCESS

Equipment costs and productivity assumptions

The thesis calculated hourly equipment costs from ownership-related and operating components. The discussion includes investment recovery, insurance, fuel, maintenance, repairs, operator wages, and supporting labor. Table 4 reproduces the resulting hourly schedule. It covers equipment used for material production, loading, transport, grading, compaction, concrete works, and road marking. These values describe the source cost model and should not be interpreted as independently verified quotations for a new project (Siregar, 2026).

Table 4. Hourly equipment prices reported in the thesis

Equipment	Code	IDR/hour
Asphalt mixing plant	E01	4,554,711.62
Asphalt finisher	E02	510,550.30
Pneumatic tire roller, 8–10 t	E18	362,379.60
Motor grader, >100 HP	E13	279,769.96
Dump truck, 10 t (6–8 m³)	E09	980,790.22
Excavator, 80–140 HP	E10	286,957.62
Flatbed truck, 3–4 t	E11	1,283,310.12
Air compressor	E05	463,373.25
Concrete mixer, 0.3–0.6 m³	E06	58,890.51
Water tanker, 3,000–4,500 L	E23	493,942.59
Concrete vibrator	E20	51,559.74
Wheel loader, 1.0–1.6 m³	E15	167,520.19
Vibratory roller, 5–8 t	E19	263,680.02
Tandem roller, 6–8 t	E17	183,864.10
Dump truck, 4 t (2–3 m³)	E08	481,226.33
Stone crusher	E21	186,596.26
Thermoplastic road-marking equipment	E85	57,710.81

Source: Siregar (2026), thesis Table 4.4. Decimal and thousands separators are presented in English notation.

The asphalt mixing plant has the highest hourly rate in the reported schedule, but the rate alone does not determine its contribution to a completed work item. The equipment coefficient must also be considered. In the AC-WC and AC-BC worksheets, the plant coefficient is reported as 0.0241 hour per tonne, with a component cost of IDR 109,752.09. The example shows how the analysis converts an hourly input into a cost assigned to a specific production quantity (Siregar, 2026, Tables 4.19–4.20).

The same principle applies to excavation and hauling. An excavator's productive capacity and a truck's transport cycle influence the operating time required per unit of work. The thesis therefore discusses cycle time, equipment efficiency, material characteristics, and operating conditions as inputs to the coefficient calculation. The analytical relationship is important even when an hourly equipment price is relatively low, because a higher time requirement increases the equipment component of the unit price (PUPR, 2025; Siregar, 2026).

The source identifies differences in labor and equipment productivity among the factors associated with the overall budget difference. However, it does not report a controlled comparison that holds prices and quantities constant while changing productivity alone. The result should therefore be read as an explanation based on the cost structure, not as a separate numerical estimate of productivity-related cost escalation. This qualification also prevents the hourly schedule from being treated as direct evidence of actual equipment utilization during construction.

OPEN ACCESS

Work quantities and pavement geometry

Quantity takeoff translated the drawings into measurable work items. The typical cross-section reproduced in Image 2 identifies the layered pavement configuration discussed in the thesis. The calculation sections use a paved width of 5.00 m, with Class A aggregate at 0.12 m, Class B aggregate at 0.15 m, AC-BC at 0.06 m, and AC-WC at 0.04 m. These dimensions are presented as source calculation inputs rather than a newly checked pavement design (Siregar, 2026).

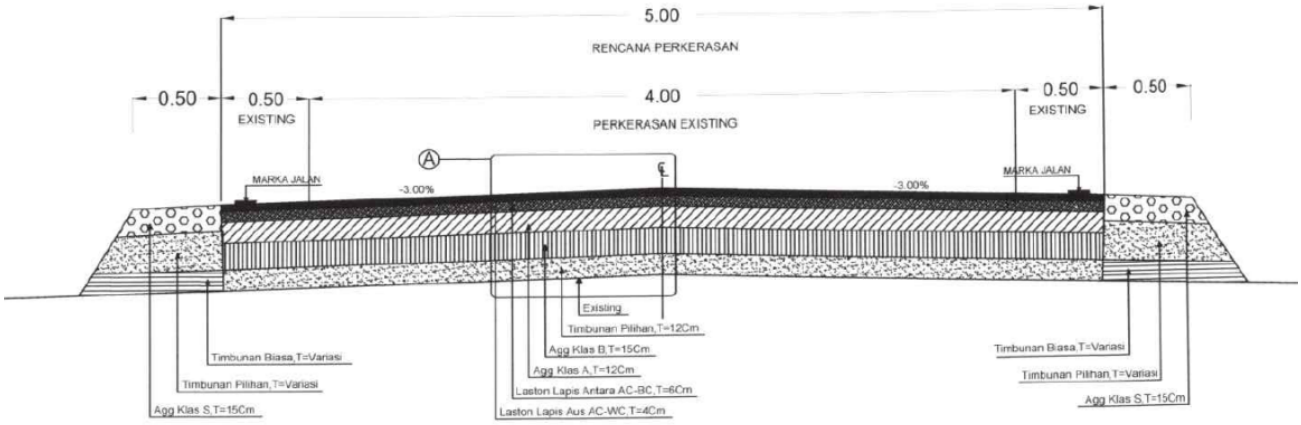


Image 2. Typical pavement cross-section reproduced from the project shop drawing.
Source: shop drawing reproduced in Siregar (2026). Software interface cropped; original technical labels retained.

Table 5. Selected work quantities reported in the thesis

Work item	Unit	Reported quantity
Roadbed preparation, calculation section	m²	23,400.00
Drainage and water-channel excavation	m³	448.85
Stone masonry with mortar	m³	461.50
Reinforced-concrete box culverts, 100 × 100 cm	m³	22.08
Ordinary excavation	m³	413.75
Ordinary fill from an excavation source	m³	5,094.00
Selected fill from an excavation source	m³	3,657.00
Class A aggregate layer	m³	2,340.00
Class B aggregate layer	m³	2,925.00
Class S aggregate layer	m³	585.00
Asphalt concrete wearing course (AC-WC)	t	1,778.40
Asphalt concrete binder course (AC-BC)	t	2,655.90
Tack coat	L	2,925.00
Anti-stripping additive	kg	710.42

Source: Siregar (2026), Sections 4.3.1, 4.3.5–4.3.7 and the quantity recap in Section 4.4. The recap lists 23,280 m² for roadbed preparation; Table 5 explicitly uses the calculation-section value.

The pavement quantities reflect the 3,900 m length used in the detailed calculations. For example, 3,900 × 5.00 × 0.12 gives 2,340 m³ of Class A aggregate. The AC-BC calculation uses 1,170 m³ and a density of 2.27 t/m³ to obtain 2,655.90 t, while 780 m³ at 2.28 t/m³ gives 1,778.40 t of AC-WC. The 3.5 km administrative length and these calculation inputs are not reconciled in the source, so the reported quantities cannot be attributed to a verified 3.5 km takeoff without further confirmation.

OPEN ACCESS

Unit price analysis of asphalt and other work items

The AHSP worksheets combine resource components before adding overhead and profit. Table 6 presents the reported component subtotals for AC-WC and AC-BC, the asphalt layers central to the project's cost comparison. The table is reproduced at subtotal level to preserve the source results without reconstructing unverified component multiplications. Both rates are stated per tonne of mixture (Siregar, 2026).

Table 6. Reported unit price components for AC-WC and AC-BC

Component	AC-WC (IDR/t)	AC-BC (IDR/t)
Labor	7,903.73	7,903.73
Materials	1,754,558.63	1,624,968.49
Equipment	140,100.00	212,382.18
Direct cost	1,902,562.36	1,845,382.41
Overhead and profit	190,256.24	184,538.41
Reported work-item unit price	**2,092,818.60**	**2,029,920.65**

Source: Siregar (2026), thesis Tables 4.19 and 4.20. Figures reproduce the worksheet subtotals; the item budget in Table 4.35 contains a different AC-BC rate.

Materials form the largest reported component in both asphalt worksheets. The AC-WC worksheet lists bitumen at 61.710 kg per tonne of mixture and a basic price of IDR 24,740.00/kg, producing a reported bitumen component of IDR 1,526,705.40. The AC-BC worksheet lists 56.6100 kg and IDR 1,400,531.40, respectively. These entries demonstrate why the thesis emphasizes asphalt and aggregate price references when explaining the divisional cost difference. They do not, however, isolate the effect of a change in bitumen price from changes in other assumptions.

Table 7. Selected unit prices from the detailed AHSP worksheets

Work item	Payment unit	IDR/unit
Drainage and water-channel excavation	m^3	116,866.69
Stone masonry with mortar	m^3	879,638.70
Reinforced-concrete box culvert	m^3*	5,553,832.82
Ordinary fill from an excavation source	m^3	91,716.13
Selected fill from an excavation source	m^3	131,684.78
Roadbed preparation	m^2	995.77
Class A aggregate layer	m^3	604,605.38
Class B aggregate layer	m^3	496,623.49
Class S aggregate layer	m^3	378,786.04
Anti-stripping additive	kg	108,600.62
Structural concrete, f'c = 20 MPa	m^3	2,438,315.49
Plain reinforcing steel, BjTP 280	kg	28,860.41

Source: Siregar (2026), Tables 4.7–4.24, selected work items. *The culvert payment unit follows the thesis quantity and item-budget tables; confirmation of its measurement basis is required.

The aggregate worksheets also show the contribution of hauling and compaction to installed costs. Their reported prices are higher than the corresponding basic aggregate prices because they include resource quantities, equipment, labor, and overhead and profit. Conversely, earthwork worksheets emphasize equipment-related activities. These differences in resource composition help explain why a change in the estimation basis does not affect all project divisions in the same direction or by the same proportion (PUPR, 2025; Siregar, 2026).

Divisional budget and overall comparison

After the item calculations, the thesis grouped costs by work division and added VAT. Table 8 places the previous project recap alongside the AHSP Bina Marga 2025 recap. The values are reproduced from the respective summary tables. Empty divisions in the original recaps, including preventive pavement and bridge rehabilitation, are not assigned new monetary amounts in this article (Siregar, 2026).

Table 8. Divisional recaps as reported in the source documents

Division or total	Previous budget (IDR)	AHSP 2025 recap (IDR)
General works	65,250,000.00	78,250,000.00
Construction safety management (SMKK)	122,502,500.00	122,502,500.00
Drainage	988,029,082.00	387,516,987.00
Earthworks and geosynthetics	919,980,318.00	1,014,812,340.00
Granular pavement and cement concrete pavement	3,845,796,618.00	3,088,990,133.00
Asphalt pavement	7,401,371,308.00	10,194,352,514.00
Structures	252,744,320.00	484,168,526.00
Dayworks and miscellaneous works	184,872,082.00	226,474,784.00
Reported work subtotal, including overhead and profit	13,760,548,318.00	15,597,067,783.00
Reported VAT	1,513,660,314.00	1,715,677,456.00
Reported total estimate	**15,274,208,632.00**	**17,312,745,239.00**

Source: Siregar (2026), thesis Tables 4.38–4.40. Values and reported subtotals are retained independently as printed. The divisional entries do not fully reconcile with the reported subtotal; this table is not a corrected budget.

The final estimate reported in the thesis is IDR 17,312,745,239.00, whereas the previous planning document reports IDR 15,274,208,632.00. The thesis concludes that the AHSP Bina Marga 2025 estimate is higher by 13.35%. Table 9 retains the headline comparison stated in the abstract and conclusion. This result describes a difference between two estimating bases, not an excess of actual expenditure over an approved final budget (Siregar, 2026).

Table 9. Headline budget comparison reported in the thesis

Measure	Reported result
Previous planning estimate	IDR 15,274,208,632.00
Estimate using AHSP Bina Marga 2025	IDR 17,312,745,239.00
Nominal difference stated in the thesis	IDR 2,038,536,606.00
Percentage difference stated in the thesis	13.35%

Source: Siregar (2026), abstract, comparison section, and conclusion. Subtracting the two displayed whole-rupiah totals gives IDR 2,038,536,607.00, a one-rupiah difference from the stated nominal result. The thesis value has not been silently replaced.

At the divisional level, the comparison is not uniform. The reported asphalt, structural, earthwork, general-work, and daywork recaps are higher, while drainage and granular pavement are lower. SMKK remains unchanged. The overall increase therefore represents the net outcome of movements across different work categories. It cannot be interpreted as a uniform 13.35% increase in every work item or resource price. The asphalt value in the final recap is IDR 10,194,352,514.00, while the detailed asphalt budget and the comparison table report IDR 10,179,789,964.00. Both are higher than the previous asphalt allocation. This preserves the direction of the thesis conclusion, but the discrepancy prevents an exact, reconciled attribution of the final total difference to asphalt pavement without checking the original calculation file.

OPEN ACCESS

Interpretation of differences across work divisions

The thesis identifies asphalt pavement as the division contributing the largest upward cost difference. Its comparison section reports an increase of IDR 2,778,418,656, or 37.54%, using the asphalt figure in the detailed comparison rather than the higher figure in the final recap. The finding is consistent with the size of the asphalt quantities and the material-intensive structure of the AC-WC and AC-BC worksheets. The exact amount remains tied to the particular source table from which it is taken (Siregar, 2026).

Table 10. Direction and reported magnitude of selected divisional changes

Division	Direction	Reported difference (IDR)	Reported magnitude
General works	Increase	13,000,000	19.92%
SMKK	Unchanged	0	0%
Drainage	Decrease	600,512,095	60.78%
Earthworks and geosynthetics	Increase	94,832,022	10.31%
Granular and cement concrete pavement	Decrease	756,806,485	19.68%
Asphalt pavement	Increase	2,778,418,656	37.54%

Source: Siregar (2026), Section 4.8 and Table 4.41. Decreases are shown as positive magnitudes with an explicit direction. The asphalt comparison uses IDR 10,179,789,964, not the value in the final recap.

Drainage shows a reported decrease of IDR 600,512,095, or 60.78%. The granular pavement and cement concrete pavement division shows a decrease of IDR 756,806,485, or 19.68%. These findings show that the higher total did not arise from increases in every division and that the overall percentage alone provides an incomplete description. At the same time, the source drainage item amounts do not reconcile with its stated drainage subtotal, so the decrease is retained as a reported result rather than treated as an independently validated saving.

Differences in basic resource price references

The source identifies basic material, wage, and equipment price references as an important explanation for the gap. Its calculation uses project-location data and the price schedules described in the method, whereas the previous budget was supplied through the project documentation. The discussion notes that tender-related pricing may differ from the price information obtained by the researcher. This remains a possible explanation; the contractor's internal pricing strategy was not independently established (Siregar, 2026).

The distinction is particularly relevant for asphalt, aggregate, cement, and reinforcing steel. A change in one basic price affects the corresponding resource component and, through the work quantity, the item cost. The AHSP structure provides a way to trace that relationship, but the presence of differing inputs in the two estimates does not prove that one is a direct observation of the other's market-price change. The reported comparison remains dependent on the selected price references and their application to each work item (PUPR, 2025; Siregar, 2026).

Coefficients, productivity, and calculated quantities

The thesis also associates the differences with AHSP coefficients and equipment and labor productivity. A coefficient change modifies the resource quantity assigned to one payment unit, even when the basic price remains constant. The source suggests that the previous planning document may have used an earlier analytical reference, but it does not establish that reference conclusively. The article therefore does not label the baseline as AHSP 2016, 2022, or any other specific edition. The comparison is correctly described as AHSP Bina Marga 2025 against the previous project budget.

The thesis also links cost differences to drawings, dimensional assumptions, and final-quantity measurement. These inputs require review before unit rates alone are used to explain the budget gap. The comparison does not separately quantify the effects of quantities, prices, or coefficients (Siregar, 2026).

OPEN ACCESS

Relationship to previous research and planning implications

The overall result is comparable to the AHSP-edition differences discussed by Gafar and Dzinnur (2022), while its emphasis on resource coefficients is consistent with Riwibowo et al. (2023). However, the Bukit Mas-Kubangan Tompek comparison involves a previous project budget whose exact AHSP basis is not confirmed. The present findings therefore support the narrower conclusion that alternative estimating inputs can yield different project budgets; they do not establish a universal escalation factor for the 2025 reference.

Following the thesis recommendations, work quantities should be checked against the drawings before unit prices are applied. Each item should retain its price schedule and worksheet reference. Traceability is particularly important for asphalt work because of its large reported contribution. These recommendations concern estimate preparation and review, not demonstrated construction or procurement improvements (Siregar, 2026).

Limitations and source-document qualifications

The analysis concerns one project and compares reported estimates rather than observed final expenditure. It does not measure cost accuracy against an independently established actual-cost benchmark, and it does not test the individual effects of prices, coefficients, productivity, and quantities statistically. Consequently, the higher estimate cannot by itself establish that the previous budget was inadequate or that the AHSP Bina Marga 2025 estimate is more accurate. The explanatory factors remain those identified through the source cost comparison.

Several internal discrepancies in the thesis limit exact numerical interpretation. The project information states 3.5 km, but major pavement calculations use 3,900 m. Roadbed preparation appears as both 23,400 m² and 23,280 m². The asphalt amount differs between the item comparison and the final recap, and the daywork values in the comparison table differ from those in the main recap. Certain item totals and component multiplications also do not agree with their stated subtotals. This article preserves the reported findings and identifies these differences rather than constructing an undocumented corrected estimate (Siregar, 2026). Despite these discrepancies, the thesis reports a higher final estimate and identifies asphalt as the principal upward contributor. The original workbook, drawings, and price records require confirmation before the figures can support an operational budget or an exact attribution of cost changes.

CONCLUSION

The study applied the AHSP Bina Marga 2025 method to the Bukit Mas-Kubangan Tompek Road Preservation Project by linking quantity takeoff with labor, material, and equipment cost analysis. Work items were grouped into divisional budgets, and the resulting estimate was compared with the previous planning document. The thesis reports a total of IDR 17,312,745,239.00, compared with IDR 15,274,208,632.00 previously, and a stated difference of IDR 2,038,536,606.00, or 13.35%.

Asphalt pavement was identified as the largest upward contributor, while drainage and granular pavement recorded lower reported estimates. The source associates the overall difference with basic resource price references, AHSP coefficients, productivity assumptions, equipment operating costs, and calculated quantities. These factors were not isolated experimentally or statistically, so the result should be interpreted as a project-specific estimate comparison rather than a causal measure of the effect of the AHSP update alone.

The thesis recommends verifying quantities against drawings and comparing additional unit price methods. Its headline findings are retained here, but the source discrepancies require confirmation before a reconciled bill of quantities is issued. The reported 13.35% difference is not evidence of actual overspending and cannot be generalized to other projects.

REFERENCES

Bachtiar, H. I. (2007). Rencana & estimate real of cost. Bumi Aksara.

Direktorat Jenderal Bina Marga. (2024). Manual desain perkerasan jalan 2024 (MDP 2024) (03/M/BM/2024). Kementerian Pekerjaan Umum dan Perumahan Rakyat.

Gafar, M. A., & Dzinnur, C. T. I. (2022). Analisis perbandingan indeks rencana anggaran biaya pada proyek preservasi jalan Surabaya-Sidoarjo menggunakan metode analisa AHSP 2016 dan analisa AHSP 2022. Jurnal Ilmu-Ilmu Teknik-Sistem, 19(3), 1–9.

Katalog Alat Berat. (2013). Alat berat untuk proyek konstruksi. Kementerian Pekerjaan Umum.

Kementerian Pekerjaan Umum dan Perumahan Rakyat. (2025). Analisis harga satuan pekerjaan (AHSP) bidang pekerjaan umum. Direktorat Jenderal Bina Konstruksi.

Mukomoko, J. A. (1987). Dasar penyusunan anggaran biaya bangunan. Gaya Media Pratama.

OPEN ACCESS

Oktaviani, R., Lusiana, & Rafie. (2025). Utilizing the AHSP method for cost estimation in road improvement at Jalan Parit Demang. Jurnal Teknik Sipil, 24(4), 1514–1522. https://doi.org/10.26418/jts.v24i4.86435

Project Management Institute. (2021). A guide to the project management body of knowledge (PMBOK® Guide) (7th ed.).

Riwibowo, N., Wijaya, O. D., Rohman, M., & Afan, M. M. (2023). Kajian analisis harga satuan pekerjaan (AHSP) SNI 2016 dibandingkan dengan Bina Marga 2020 pada pekerjaan lapis aspal AC-BC dan AC-WC. Wahana Teknik Sipil: Jurnal Pengembangan Teknik Sipil, 28(1).

Siregar, I. E. (2026). Analisis perencanaan anggaran biaya proyek preservasi jalan Bukit Mas-Kubangan Tompek metode AHSP Bina Marga 2025 [Undergraduate thesis, Politeknik Negeri Medan].

Zulfansyah, M., Bakhtiar, A., & Putra, I. (2022). Komparasi antara analisa EI dan AHSP Bina Marga pada proyek pemeliharaan berkala jalan Paya Bakong Cluster IV. Jurnal Sipil Sains Terapan.

Bibliographic qualification: publication details follow the thesis reference list. Gafar and Dzinnur are dated 2023 in its literature chapter but 2022 in its bibliography; the bibliography year is used here. The complete page range for Riwibowo et al. is not supplied and requires confirmation.

OPEN ACCESS