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Performance Control of Road and Bridge Preservation Projects Using Earned Value Management (EVM) Method

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earned value method; project performance; project cost

ABSTRACT
The Situbondo – Ketapang – Banyuwangi Road and Bridge Preservation Project experienced changes in the work area, requiring additional design. Asphalt overlay work was halted awaiting the test results of Asphalt Modiv PG – 70 from the Pusjatan Road Material Laboratory in Bandung, resulting in a delay in week 40 by -0.813%. Specifically, AC - WC and AC - BC asphalt work was delayed, significantly impacting the overall project performance. Cost and time analysis are crucial to address this issue. The Earned Value Management (EVM) method is used to evaluate project duration and costs. The Cost Performance Index (CPI) indicates good cost performance (>1), but the Schedule Performance Index (SPI) indicates schedule delays (0.983 < 1). The final project cost is estimated at Rp 112,439,121,070.91, with a completion time of 453 days, three days longer than planned. Effective strategies are needed in time control and design adjustments to complete the project according to expected standards.

Introduction

The role of infrastructure is very crucial in spurring economic growth at various levels, both national and regional. Adequate infrastructure not only functions to increase economic activity and business development, but also contributes significantly to reducing unemployment, alleviating poverty and improving community welfare (Alkas et al., 2023). The Indonesian Government's commitment to developing infrastructure is reflected in the various policies and projects that have been and are being implemented (LIEW et al., 2021). One of the main components in infrastructure development is construction projects. In Indonesia, construction projects often face obstacles that cause delays, a classic problem that almost always appears in every large project (Arifin et al., 2023). Technical obstacles, logistics, as well as administrative and managerial problems are often the cause of project delays, which ultimately hinder project implementation according to the predetermined schedule (Natalia et al., 2021).

As part of the government's efforts to provide adequate road infrastructure, the Situbondo - Ketapang - Banyuwangi Road and Bridge Preservation project is currently being implemented (Asmoro et al., 2023). This project is an important part of the national

road network which functions as land transportation infrastructure, supporting community mobility as well as economic and social activities (Kurniawati et al., 2022). Based on Road and Bridge Information System Development Data from the Directorate of Road and Bridge Engineering, Directorate General of Highways (March 2023), of the total length of 1359.2 km of non-toll national roads in East Java, 57.56% are in good condition, 39.79% are in fair condition, 2.46% were slightly damaged, and 0.19% were seriously damaged (Siswanto & Salim, 2018). To prevent further damage, the government, through the Directorate General of Highways, Ministry of Public Works, and Public Housing, is implementing a Road and Bridge Preservation program to maintain optimal road conditions. (Kurniawati et al., 2022).

The Situbondo – Ketapang – Banyuwangi Road and Bridge Preservation Project for the 2023-2024 Fiscal Year aims to optimize the use of preservation funds and maintain the level of road service (Bonny et al., 2022). This project is funded by the 2023-2024 APBN with PT. Bumi Duta Persada (KSO) PT. Rajendra Pratama Jaya, based on contract Number: HK.02.03-Bb8.6/1.2/736, dated 23 June 2023, with a ceiling value of Rp. 159,332,043,000. The work in this project includes minor rehabilitation, major rehabilitation, periodic maintenance, and bridge replacement with an implementation period of 450 calendar days (Christy et al., 2023). Any changes to the work location and adjustments to the unit price of items in this project are stated in the contract addendum to ensure that the work goes according to plans and specifications (Ismail & Darkasyi, 2023).

Comfortable and safe road conditions are the main priority in this project. Therefore, reconstruction of roads that have experienced damage such as cracks and subsidence due to excessive vehicle loads is very necessary. The government has allocated APBN funds for this preservation project, with the appointed implementer being PT. Bumi Duta Persada – PT. Rajendra Pratama Jaya (KSO) (Natalia et al., 2021). To overcome delays and changes that are not in accordance with the initial contract, consistent and integrated performance control is needed. The Earned Value Management (EVM) concept is the right method for controlling project performance, ensuring that projects can be completed on time, at the right quality and at the right cost. (Susanti et al., 2019). By using the EVM method, projects can be monitored and evaluated thoroughly to ensure that all aspects of the work comply with the initial plan. EVM will be used to research the Situbondo – Ketapang – Banyuwangi Road and Bridge Preservation project, to determine the duration and costs required to complete the project (Pamungkas & Andreas, 2021).

Research Methods

This research was conducted on the Situbondo – Ketapang – Banyuwangi Road and Bridge Preservation Project for the 2023/2024 Fiscal Year. Data is collected from implementing contractors and supervisory consultants, and includes project schedules, Cost Budget Plans (RAB), weekly reports, and actual costs.

The research took place from the third week of February to March 2024, including preparation, initial survey, literature review, data collection, analysis, and thesis preparation. Data was analyzed using the Earned Value method, with a focus on Planned Value (PV), Earned Value (EV), and Actual Cost (AC). Variance analysis includes Cost Variance (CV) and Schedule Variance (SV), while the performance index is measured through the Schedule Performance Index (SPI) and Cost Performance Index (CPI). Estimated costs and final work time are calculated using Estimate to Complete (ETC),

Estimate at Complete (EAC), and Time Estimate (TE). Project progress or delay factors are analyzed through interviews, direct observation, and checking weekly and daily reports.

Research steps include determining the background, formulating the problem, collecting, and analyzing data (PV, EV, AC, CV, SV, CPI, SPI), calculating cost and time estimates (ETC, EAC, TE), and drawing conclusions. In the research carried out on the construction of the Situbondo - Ketapang - Banyuwangi Road and Bridge Preservation Agency building, it was obtained from implementing contractors and several supervisory consultants. The types of data collected are secondary data and literature studies, including: (1) Project implementation schedule (Time Schedule), (2) S Curve (Master schedule), Is a reference or time plan for each work/implementation. (3) Actual project S curve. The actual project S curve is updated every week on the planned time schedule according to the weight of the progress of work that has been implemented and that has not been implemented. From the actual time schedule, it will be known that the work has progressed in performance (progress plus) or experienced a decrease in performance (progress minus) from the initial plan. (4) Cost Budget Plan (RAB) Is the budgeted cost to complete all work items. The RAB is stated in the work contract between the owner (project owner) and the implementing contractor which consists of unit price analysis, wage list and material prices. (5) Weekly Project Report, this is a progress report on project achievements that have been achieved in one weekly period. In this project, the progress cut off is carried out every Saturday so that the weekly progress period starts from Sunday to Saturday. This weekly report contains the volume and weight of work progress in that weekly period. (6) Actual Cost, Actual costs are costs that have been incurred for work that has been completed. A recap of actual costs (close the cost book) of this project is carried out at the end of every month, precisely on every date.

Results and Discussions

Calculation of Planned Value (PV) / BCWS

This research analyzes the performance of development projects in the Situbondo – Ketapang – Banyuwangi Road and Bridge Preservation Project for the 2023/2024 Fiscal Year. Using the Earned Value Management (EVM) method, this research compares initial project plans with actual results to measure project performance and progress (Indramanik et al., 2022). The data analyzed includes the project schedule, Planned Cost Budget (RAB), weekly reports, and actual costs, which are used to calculate the Planned Value (PV) or Budgeted Cost of Work Scheduled (BCWS).

Table 1 PV or BCWS

Week To	Plan Progress (%)	Cumulative Plan (%)	Budget (Rp)	PV or BCWS (Rp)
1	0,0430	0,0430	23.200.000.000	52.976.000,00
2	0,1005	0,1435	23.200.000.000	176.844.448,38
3	0,1325	0,2761	23.200.000.000	340.136.396,76
4	0,1194	0,3955	23.200.000.000	487.291.075,24
5	0,1194	0,5150	23.200.000.000	634.445.753,72
6	0,0757	0,5907	23.200.000.000	727.683.540,63
7	0,2605	0,8511	23.200.000.000	1.048.572.123,65
8	0,4495	1,3006	23.200.000.000	1.602.384.519,96
9	0,3223	1,6229	23.200.000.000	1.999.413.079,85

10	0,8275	2,4504	23.200.000.000	52.976.000,00
11	0,9519	3,4023	23.200.000.000	176.844.448,38
12	1,3033	4,7056	23.200.000.000	340.136.396,76
13	1,3238	6,0294	23.200.000.000	3.018.923.515,84
14	1,4685	7,4979	23.200.000.000	4.191.660.128,92
15	1,4706	8,9685	23.200.000.000	5.797.330.290,48
16	1,5221	10,4906	23.200.000.000	7.428.213.566,89
17	3,4536	13,9441	23.200.000.000	9.237.385.927,29
18	1,2422	15,1863	23.200.000.000	1.049.166.302,21
19	3,1825	18,3688	23.200.000.000	2.924.360.260,21
20	2,8871	21,2558	23.200.000.000	7.179.147.782,60
21	0,4730	21,7288	23.200.000.000	8.709.479.059,11
22	4,3263	26,0551	23.200.000.000	2.630.331.471,05
23	4,1623	30,2174	23.200.000.000	6.187.179.493,85
24	2,7025	32,9199	23.200.000.000	6.769.885.075,22
25	2,0128	34,9327	23.200.000.000	2.099.846.663,95
26	0,3613	35,2940	23.200.000.000	7.227.825.190,77
27	2,9107	38,2046	123.200.000.000	40.557.272.011,94
28	0,0003	38,2049	23.200.000.000	3.037.025.400,55
29	0,5210	38,7259	23.200.000.000	3.482.166.062,93
30	0,0496	38,7755	23.200.000.000	7.068.118.478,95
31	2,6986	38,2049	23.200.000.000	7.068.473.801,49
32	0,1508	38,7259	23.200.000.000	7.710.345.801,49
33	1,0571	38,7755	23.200.000.000	7.771.442.188,30
34	0,5262	41,4742	23.200.000.000	1.096.155.121,87
35	0,7363	41,6250	23.200.000.000	1.282.000.000,00
36	1,1399	42,6821	23.200.000.000	2.584.301.175,42
37	0,8901	43,2083	23.200.000.000	3.232.613.753,16
38	0,5924	43,9446	23.200.000.000	4.139.685.918,98
39	0,5924	45,0845	23.200.000.000	5.544.085.113,69
40	1,7628	45,9746	23.200.000.000	6.640.699.393,97

Source: Researcher Process 2024.

Table 1 shows that in the first week, project progress reached 0.0430% with a PV of IDR 52,976,000. In the 10th week, progress increased to 2.4504% with a PV of IDR 3,018,923,515.84. In the 20th week, cumulative progress reached 21.2558% with a PV of IDR 17,179,147,782.60. A significant increase occurred in the 22nd and 23rd weeks with cumulative progress reaching 30.2174% and PV IDR 26,187,179,493.85 respectively. Until the 40th week, progress reached 45.9746% with a PV of IDR 56,640,699,393.97. The project showed steady progress with some significant improvements in certain periods, indicating effective resource allocation during those weeks (Irawan et al., 2019). This analysis helps identify areas that need improvement to ensure the project stays within the established budget and schedule.

BCWP Earned Value (EV) or BCWP calculation.

This research evaluates the performance of development projects using the Earned Value Management (EVM) method. The focus of the analysis is on the comparison between initial plans and actual results, including weekly progress and budget usage. The

data analyzed includes weekly progress, realized costs, and Budgeted Cost of Work Performed (BCWP) for a 40-week period (Proboretno et al., 2024).

Table 2 EV or BCWP

Week	Progress		Budget (RP)	Ev atau BCWP	
	Realization	Cumulative		Realization (Rp)	Cumulative (Rp)
1	0,0000	0,0000	123.200.000.000,	-	-
2	0,0498	0,0498	123.200.000.000,	61.368.856,36	61.368.856,36
3	0,0493	0,0991	123.200.000.000,	60.702.856,36	122.071.712,73
4	0,0393	0,1383	123.200.000.000,	48.362.485,09	170.434.197,82
5	0,0300	0,2113	123.200.000.000,	36.946.242,55	207.380.440,36
6	0,1077	0,3190	123.200.000.000,	132.688.340,90	340.068.781,26
7	0,3439	0,6629	123.200.000.000,	423.644.974,09	763.713.755,35
8	0,3345	0,9974	123.200.000.000,	412.152.371,42	1.175.866.126,77
9	0,3813	1,3787	123.200.000.000,	469.735.958,04	1.645.602.084,82
10	0,4921	1,8708	123.200.000.000,	606.261.792,70	2.251.863.877,52
11	0,6494	2,5202	123.200.000.000,	800.012.635,47	3.051.876.512,99
12	0,7557	3,2759	123.200.000.000,	931.082.030,05	3.982.958.543,04
13	2,2644	5,5403	123.200.000.000,	2.789.751.466,9	6.772.710.010,00
14	2,4951	8,0355	123.200.000.000,	3.073.996.623,9	9.846.706.633,92
15	0,5865	8,6220	123.200.000.000,	722.612.968,67	10.569.319.602,5
16	1,1126	9,7346	123.200.000.000,	1.370.781.784,6	11.940.101.387,2
17	5,5048	15,2394	123.200.000.000,	6.781.863.412,7	18.721.964.800,0
18	0,8021	16,0415	123.200.000.000,	988.187.200,00	19.710.152.000,0
19	0,2456	16,2871	123.200.000.000,	302.579.200,00	20.012.731.200,0
20	0,2982	16,5853	123.200.000.000,	367.428.671,83	20.380.159.871,8
21	2,7571	19,3424	123.200.000.000,	3.396.748.298,6	3.776.908.170,5
22	4,0148	23,3572	123.200.000.000,	4.946.213.990,1	28.723.122.160,6
23	3,7640	27,1212	123.200.000.000,	4.637.233.176,0	33.360.355.336,7
24	2,0157	29,1369	123.200.000.000,	2.483.317.392,9	35.843.672.729,6
25	2,4771	31,6139	123.200.000.000,	3.051.731.765,3	38.895.404.495,0
26	3,5557	35,1696	123.200.000.000,	4.380.617.983,9	43.276.022.478,9
27	3,9397	39,1093	123.200.000.000,	4.853.650.230,1	48.129.672.709,1
28	0,0000	39,1093	123.200.000.000,	-	48.129.672.709,1
29	0,0000	39,1093	123.200.000.000,	-	48.129.672.709,1
30	0,5283	39,6376	123.200.000.000,	650.913.005,13	48.780.585.714,2
31	0,5283	40,1660	123.200.000.000,	650.913.005,13	49.431.498.719,3
34	0,1570	42,5057	123.200.000.000	193.445.968,56	52.314.055.745,8
35	0,4118	42,9175	123.200.000.000,	507.335.390,03	52.821.391.135,8
36	1,2487	44,1662	123.200.000.000,	1.538.387.337,3	54.359.778.473,2
37	0,6640	44,8302	123.200.000.000,	818.031.375,21	55.177.809.848,4
38	0,1828	45,0130	123.200.000.000,	225.266.490,77	55.403.076.339,1
39	0,2594	45,2724	123.200.000.000,	319.569.357,97	55.722.645.697,1
40	2,8798	48,1522	123.200.000.000	3.547.926.859,5	59.270.572.556,7

Source: Researcher Process 2024.

Table 2 shows that in the second week, the project recorded progress of 0.0498% with a BCWP of IDR 61,368,856.36. Until the 10th week, cumulative progress reached 1.8708% with a BCWP of IDR 2,251,863,877.52. In the 17th week, progress reached 15.2394% with a BCWP of IDR 18,721,964,800.00. Weeks 22 and 23 showed a significant spike with cumulative progress of 23.3572% and 27.1212%, and BCWP of IDR 33,360,355,336.70. In the 40th week, cumulative progress reached 48.1522% with a

BCWP of IDR 59,270,572,556.70. The project showed steady improvement despite weeks without significant progress, which helped monitor resource allocation and strategy adjustments to keep the project on budget and on schedule (Riduwan et al., 2023).

Calculation of Actual Cost (AC)

This analysis assesses project performance for 40 weeks using the Earned Value Management (EVM) method, with a focus on the comparison between Planned Value (PV), Earned Value (EV), and Actual Cost (AC).

Table 3 Comparison of PV, EV, and AC

Week	PV or BCWS (Rp)	EV or BCWP (Rp)	Actual Cost (Rp)
1	52.976.000,00	-	
2	176.844.448,38	61.368.856,36	
3	340.136.396,76	122.071.712,73	
4	487.291.075,24	170.434.197,82	
5	634.445.753,72	207.380.440,36	
6	727.683.540,63	340.068.781,26	
7	1.048.572.123,65	763.713.755,35	
8	1.602.384.519,96	1.175.866.126,77	
9	1.999.413.079,85	1.645.602.084,82	
10	3.018.923.515,84	2.251.863.877,52	
11	4.191.660.128,92	3.051.876.512,99	
12	5.797.330.290,48	3.982.958.543,04	
13	7.428.213.566,89	6.772.710.010,00	
14	9.237.385.927,29	9.846.706.633,92	
15	11.049.166.302,21	10.569.319.602,59	
16	12.924.360.260,21	11.940.101.387,25	
17	17.179.147.782,60	18.721.964.800,00	155.535.750,00
18	18.709.479.059,11	19.710.152.000,00	1.234.202.250,00
19	22.630.331.471,05	20.012.731.200,00	1.234.202.250,00
20	26.187.179.493,85	20.380.159.871,83	7.124.011.500,00
21	26.769.885.075,22	23.776.908.170,51	7.124.011.500,00
22	32.099.846.663,95	28.723.122.160,68	12.946.810.500,00
23	37.227.825.190,77	33.360.355.336,77	25.982.046.197,60
24	40.557.272.011,94	35.843.672.729,67	25.982.046.197,60
25	43.037.025.400,55	38.895.404.495,03	25.982.046.197,60
26	43.482.166.062,93	43.276.022.478,95	25.982.046.197,60
27	47.068.118.478,95	48.129.672.709,14	39.267.286.950,60
28	47.068.473.801,49	48.129.672.709,14	40.978.107.352,20
29	47.710.345.801,49	48.129.672.709,14	40.978.107.352,20
30	47.771.442.188,30	48.780.585.714,27	40.978.107.352,20
31	51.096.155.121,87	49.431.498.719,39	40.978.107.352,20
32	51.282.000.000,00	50.512.000.000,00	40.978.107.352,20
33	52.584.301.175,42	52.120.609.777,29	40.978.107.352,20
34	53.232.613.753,16	52.314.055.745,85	40.978.107.352,20
35	54.139.685.918,98	52.821.391.135,88	42.184.352.968,20
36	55.544.085.113,69	54.359.778.473,21	42.184.352.968,20
37	56.640.699.393,97	55.177.809.848,42	42.184.352.968,20
38	57.370.523.512,43	55.403.076.339,19	42.184.352.968,20
39	58.100.347.630,90	55.722.645.697,16	42.184.352.968,20
40	60.272.113.645,19	59.270.572.556,73	8.597.173.030,20

Source: Researcher Process 2024.

In this development project, initial progress was slow with a Planned Value (PV) of IDR 52,976,000.00 and Earned Value (EV) starting to be measured in the second week. During the first 10 weeks, EV increased consistently but remained below PV, indicating steady but slow progress (Muniroh et al., 2021). A significant increase occurred in week 17 with EV surpassing PV, indicating acceleration in project implementation. However, the actual cost spikes start to become visible in the 20th week onwards. In the 40th week, the project was almost complete with PV of IDR 60,272,113,645.19, EV IDR 59,270,572,556.73, and Actual Cost (AC) IDR 8,597,173,030.20. Overall, the project went according to plan with few manageable cost deviations (Ritonga et al., 2023).

Project Performance Calculations, Cost Estimates and Project Completion Time

This analysis assesses project performance for 40 weeks using the Earned Value Management (EVM) method, with a focus on the comparison between Planned Value (PV), Earned Value (EV), and Actual Cost (AC) (Pratama, 2022).

Table 4 PV or BCWS, EV or BCWP, Actual Cost, Schedule Variance (SV) and Cost Variance (SV)

Week	PV or BCWS (Rp)	EV or BCWP(Rp)	Actual Cost (Rp)	Schedule Variance (SV)
1	52.976.000,00	-	-	-52.976.000,00
2	176.844.448,38	61.368.856,36	-	-115.475.592,02
3	340.136.396,76	122.071.712,73	-	-218.064.684,03
4	487.291.075,24	170.434.197,82	-	-316.856.877,42
5	634.445.753,72	207.380.440,36	-	-427.065.313,35
6	727.683.540,63	340.068.781,26	-	-387.614.759,36
7	1.048.572.123,65	763.713.755,35	-	-284.858.368,29
8	1.602.384.519,96	1.175.866.126,77	-	-426.518.393,19
9	1.999.413.079,85	1.645.602.084,82	-	-353.810.995,03
10	3.018.923.515,84	2.251.863.877,52	-	-767.059.638,32
11	4.191.660.128,92	3.051.876.512,99	-	-1.139.783.615,93
12	5.797.330.290,48	3.982.958.543,04	-	-1.814.371.747,44
13	7.428.213.566,89	6.772.710.010,00	-	-655.503.556,89
14	9.237.385.927,29	9.846.706.633,92	-	609.320.706,63
15	11.049.166.302,21	10.569.319.602,59	-	-479.846.699,62
16	12.924.360.260,21	11.940.101.387,25	-	-984.258.872,96
17	17.179.147.782,60	18.721.964.800,00	155.535.750,00	1.542.817.017,40
18	18.709.479.059,11	19.710.152.000,00	1.234.202.250,00	1.000.672.940,89
19	22.630.331.471,05	20.012.731.200,00	1.234.202.250,00	-2.617.600.271,05
20	26.187.179.493,85	20.380.159.871,83	7.124.011.500,00	-5.807.019.622,02
21	26.769.885.075,22	23.776.908.170,51	7.124.011.500,00	-2.992.976.904,71
22	32.099.846.663,95	28.723.122.160,68	12.946.810.500,00	-3.376.724.503,27
23	37.227.825.190,77	33.360.355.336,77	25.982.046.197,60	-3.376.724.503,27
24	40.557.272.011,94	35.843.672.729,67	25.982.046.197,60	-3.867.469.854,01
25	43.037.025.400,55	38.895.404.495,03	25.982.046.197,60	-4.713.599.282,27
26	43.482.166.062,93	43.276.022.478,95	25.982.046.197,60	-4.141.620.905,51
27	47.068.118.478,95	48.129.672.709,14	39.267.286.950,60	-206.143.583,98
28	47.068.473.801,49	48.129.672.709,14	40.978.107.352,20	1.061.554.230,19
29	47.710.345.801,49	48.129.672.709,14	40.978.107.352,20	1.061.198.907,65
30	47.771.442.188,30	48.780.585.714,27	40.978.107.352,20	419.326.907,65
31	51.096.155.121,87	49.431.498.719,39	40.978.107.352,20	1.009.143.525,97
32	51.282.000.000,00	50.512.000.000,00	40.978.107.352,20	-1.664.656.402,47
33	52.584.301.175,42	52.120.609.777,29	40.978.107.352,20	-770.000.000,00
34	53.232.613.753,16	52.314.055.745,85	40.978.107.352,20	-918.558.007,31
35	54.139.685.918,98	52.821.391.135,88	42.184.352.968,20	-1.318.294.783,10
36	55.544.085.113,69	54.359.778.473,21	42.184.352.968,20	-1.184.306.640,47

37	56.640.699.393,97	55.177.809.848,42	42.184.352.968,20	-1.462.889.545,55
38	57.370.523.512,43	55.403.076.339,19	42.184.352.968,20	-1.967.447.173,24
39	58.100.347.630,90	55.722.645.697,16	42.184.352.968,20	-2.377.701.933,73
40	60.272.113.645,19	59.270.572.556,73	48.597.173.030,20	-1.001.541.088,46

Source: Researcher Process 2024.

In the early stages of the project, progress was slow with the Planned Value (PV) reaching IDR 52,976,000.00 and the Earned Value (EV) was only measured in the second week. During the first 10 weeks, EV increased consistently but remained below PV, indicating steady but slow progress. A significant increase occurred in week 17 when EV exceeded PV, indicating an acceleration in project implementation. However, a spike in actual costs was seen in week 20 onwards. When it reached week 40, the project had almost reached completion with PV of IDR 60,272,113,645.19, EV IDR 59,270,572,556.73, and Actual Cost (AC) IDR 8,597,173,030.20. Overall, the project went according to plan with few manageable cost deviations (Sujarwo & Oetomo, 2022).

Achievement Index Calculation

Analysis of project performance for 40 weeks using the Earned Value Management (EVM) method aims to evaluate the effectiveness of project implementation by comparing Planned Value (PV), Earned Value (EV), and Actual Cost (AC), as well as measuring the Schedule Performance Index (SPI) and Cost Performance Index (CPI).

Table 5 Time Performance Index (SPI) and Cost Performance Index (CPI)

Week	PV or BCWS	EV or BCWP	ACWP	SPI	CPI
1	52.976.000,00	-	-	0,000	0,000
2	176.844.448,38	61.368.856,36	-	0,347	0,000
3	340.136.396,76	122.071.712,73	-	0,359	0,000
4	487.291.075,24	170.434.197,82	-	0,350	0,000
5	634.445.753,72	207.380.440,36	-	0,327	0,000
6	727.683.540,63	340.068.781,26	-	0,467	0,000
7	1.048.572.123,65	763.713.755,35	-	0,728	0,000
8	1.602.384.519,96	1.175.866.126,77	-	0,734	0,000
9	1.999.413.079,85	1.645.602.084,82	-	0,823	0,000
10	3.018.923.515,84	2.251.863.877,52	-	0,746	0,000
11	4.191.660.128,92	3.051.876.512,99	-	0,728	0,000
12	5.797.330.290,48	3.982.958.543,04	-	0,687	0,000
13	7.428.213.566,89	6.772.710.010,00	-	0,912	0,000
14	9.237.385.927,29	9.846.706.633,92	-	1,066	0,000
15	11.049.166.302,21	10.569.319.602,59	-	0,957	0,000
16	12.924.360.260,21	11.940.101.387,25	-	0,924	0,000
17	17.179.147.782,60	18.721.964.800,00	155.535.750,00	1,090	#####
18	18.709.479.059,11	19.710.152.000,00	1.234.202.250,00	1,053	15,970
19	22.630.331.471,05	20.012.731.200,00	1.234.202.250,00	0,884	16,215
20	26.187.179.493,85	20.380.159.871,83	7.124.011.500,00	0,778	2,861
21	26.769.885.075,22	23.776.908.170,51	7.124.011.500,00	0,888	3,338
22	32.099.846.663,95	28.723.122.160,68	12.946.810.500,00	0,895	2,219
23	37.227.825.190,77	33.360.355.336,77	25.982.046.197,60	0,896	1,284
24	40.557.272.011,94	35.843.672.729,67	25.982.046.197,60	0,884	1,380
25	43.037.025.400,55	38.895.404.495,03	25.982.046.197,60	0,904	1,497
26	43.482.166.062,93	43.276.022.478,95	25.982.046.197,60	0,995	1,666
27	47.068.118.478,95	48.129.672.709,14	39.267.286.950,60	1,023	1,226
28	47.068.473.801,49	48.129.672.709,14	40.978.107.352,20	1,023	1,175
29	47.710.345.801,49	48.129.672.709,14	40.978.107.352,20	1,009	1,175
30	47.771.442.188,30	48.780.585.714,27	40.978.107.352,20	1,021	1,190
31	51.096.155.121,87	49.431.498.719,39	40.978.107.352,20	0,967	1,206
32	51.282.000.000,00	50.512.000.000,00	40.978.107.352,20	0,985	1,233

33	52.584.301.175,42	52.120.609.777,29	40.978.107.352,20	0,991	1,272
34	53.232.613.753,16	52.314.055.745,85	40.978.107.352,20	0,983	1,277
35	54.139.685.918,98	52.821.391.135,88	42.184.352.968,20	0,976	1,252
36	55.544.085.113,69	54.359.778.473,21	42.184.352.968,20	0,979	1,289
37	56.640.699.393,97	55.177.809.848,42	42.184.352.968,20	0,974	1,308
38	57.370.523.512,43	55.403.076.339,19	42.184.352.968,20	0,966	1,313
39	58.100.347.630,90	55.722.645.697,16	42.184.352.968,20	0,959	1,321
40	60.272.113.645,19	59.270.572.556,73	48.597.173.030,20	0,983	1,220

Source: Researcher Process 2024.

The initial weeks of the project were late, characterized by an SPI below 1. However, starting in the 13th week, there was an improvement with the SPI approaching 1. In the 14th week, the project achieved excellence with an SPI above 1, indicating schedule efficiency. Cost-wise, challenges occurred, especially in week 20 with the CPI dropping drastically. However, the project managed to maintain CPI above 1 after week 26, indicating better cost control. The project is almost complete, with PV IDR 60,272,113,645.19, EV IDR 59,270,572,556.73, and AC IDR 48,597,173,030.20. SPI 0.983 and CPI 1.220, indicating project efficiency with controlled costs despite challenges.

Calculation of Project Time and Cost Estimates

Making a cost estimate or project completion schedule based on indicators obtained during reporting will provide an indication of the cost at the end of the project (estimate at completion = EAC) and the estimated time for project completion (Estimate all schedule = EAS).

Calculation of Final Estimated Project Time

Cost or schedule forecasts are very useful because they provide early warning about things that will happen in the future, if the existing trends at the time of reporting do not change. At the end of the review, namely in the 40th week, the estimated remaining work time, Estimate Temporary Schedule (ETS) is as follows:

ETS= (remaining time) / SPI

ETS = (450 - 275) / 0.98338

ETS = 175 / 0.98338 = 177.957 = 178 days

Meanwhile, the estimated time for completion of all work, Estimate All Schedule (EAS)

EAS = finish time + ETS

EAS = 275 + 178

EAS = 453 days

From the calculations above, the working time is 3 days longer than the planned schedule of 450 days. This can be anticipated by increasing working hours for work in the granular pavement division and the Structures Division.

Calculation of Estimated Final Project Costs

At the end of the review, namely at week 65, the estimated time of work

remaining, Estimate Temporary Cost (ETC) is as follows:

ETC = Budget – BCWP / SPI

ETC = (IDR 123,200,000,000 – IDR 122,198,458,911.54)/ 0.9919

ETC = IDR 914,061,685

EAC = ACWP + ETC

EAC = IDR 111,525,059,385.01 + IDR 914,061,685

EAC = IDR 112,439,121,070.91

From the calculation above, we get an estimated final project cost of IDR 112,439,121,070.91, this cost is smaller than the contract value, namely IDR. 123,200,000,000.

Conclusion

Based on the Earned Value analysis that has been calculated in Chapter 4, the conclusions that can be drawn are:

Cost performance on the Situbondo – Ketapang – Banyuwangi Road and Bridge preservation project with a CPI value of more than 1 indicates good cost performance. Meanwhile, the SPI value at week 40 of monitoring was 0.983, which was smaller than 1, indicating that work time performance was not as expected or experienced a delay from what had been planned.

Estimated cost indicator Estimate Temporary Cost is Rp. 914,061,685 and estimated cost until the end of the project is 112,439,121,070.91 and estimated time required until the project ends Estimate Temporary Schedule is 178 calendar days. Meanwhile, estimated time for completion of all work / Estimate All Schedule (EAS) is 453 days, 3 days longer than the planned schedule.

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