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UDC 331

CONSTRUCTION MANAGEMENT PERFORMANCE IMPROVEMENT IN COMMUNITY-BASED PROJECT

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ABSTRACT
Community-based project scheme is a solution for government in fulfilling the needs of basic infrastructure development which is pretty high with the existing limit of budget. However, the presence of community understanding diversity related to the implementation technique and construction management causes the project implementation not efficient and will impact the quality of work output to be not as expected. The objective of this study was to evaluate construction management's performance against the community-based project through a case study of (SANIMAS) program. Aspects evaluated in the projects include cost control performance, time, and work output quality. From the evaluation result, it obtains various problems that cause the low performance of construction management in that community-based project. Furthermore, based on the evaluation result, it then conducts an analysis to get an alternative solution which can improve construction management performance and make a preventive step so that the problem will be not repeated in the future.

KEY WORDS
Community-based project, SANIMAS, performance evaluation, construction management.

The needs of basic infrastructure development which is pretty high but not supported with a good budget capability makes the government starts to develop infrastructure development model using community-based project scheme. One example of activity applying that scheme is SANIMAS program.

One of the positive sides of SANIMAS program is community will be involved in the development of sanitation facility and infrastructure so indirectly having a sense of belonging towards the development result of facility and infrastructure which has been built.An active involvement of community from the planning stage to the post-construction (Bottom Up) stage makes the facility and infrastructure built continuously maintain since the existing of support from society.

However, community understanding diversity related to the performance technique and construction management causes the implementation of the project not efficient and will have an impact on the work output quality, moreover, infrastructure which will be built is a building which is pretty high and needs a special ability so will function well.

According to that matter, it needs to conduct an evaluation to know the efficiency of construction management performance of SANIMAS program. Furthermore, that evaluation result can be made as a reference to improveconstruction management performance of SANIMAS.

LITERATURE REVIEW

Construction Management Function. The reason to apply construction project management is to administer management function or to set development performance in a way that will get an optimum result as the requirement. Widiasanti and Lenggogeni (2014)

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have described management functions as proposed by several experts in management which actually has a similarity as follows:

- Louis Allen: *Planning, Organizing, Leading, Controlling* (POLC);
- Harold Koontz: *Planning, Staffing, Directing, Leading, Controlling* (POSDLC);
- Luther Gulick: *Planning, Staffing, Directing, Coordinating, Reporting, Budgeting* (POSDiCorB);
- George R. Terry: *Planning, Organizing, Actuating, Controlling* (POAC).

To achieve that management goal, elements which need to be considered are cost, construction quality, and time to build or commonly called Triple Constraint.

Definition of Evaluation. The term of evaluation is defined as estimation or assessment. According to Stuffelbean et al (1971), evaluation is defined as "The process of delineating, obtaining, and providing useful information for judging decision alternatives".

Evaluation is actually an activity to measure and assess. Measuring is more quantitative in nature, while assessing is more in qualitative. One performance evaluation stage which is frequantly used is (Umar, 2002):

- Determining what will be evaluated;
- Designing performance evaluation activity;
- Collecting data;
- Processing and analyzing data;
- Reporting evaluation result.

Performance Evaluation with Earned Value Method. Earned Value is a concept to calculate how much the cost which according to the budget relates to the finished assignment. Project control through the Earned Value method provides information about project progress position and is able to bring progress for the next period, in terms of time to finish the project (Husein, 2011).

This method is able to know the ongoing progress so can be conducted improvement steps if there is a violation from the initial plan. Indicators used in the concept of result value are (Soeharto, 1999):

- *Budgeted Cost of Work Scheduled* (BCWS) is expense budget allocated based on the work plan that has been compiled towards time;
- *Actual Cost of Work Performed* (ACWP) is a representation of the entire expenditure allocated to finish work in a certain period;
- *Budgeted Cost of Work Performed* (BCWP) is a received value from works finishing during a certain period.

Those indicators are used to analyze project performance which includes (Soeharto, 1999):

Cost Variance (CV). Cost variance is discrepancy between earned value after finishing a set of assignment with actual cost happening during project implementation. Positive cost variance shows that the value of work packages obtained is greater than the expenses which are disbursed.

$$CV = BCWP – ACWP$$

Schedule Variance (SV). Schedule variance is used to calculate the difference between BCWS and BCWP. Positive value shows that the executed packages of project working are many more than the plan.

$$SV = BCWP – BCWS$$

Cost Peformance Index (CPI)/ Cost Performance Index is an efficiency factor of disbursed expenses which can be shown by comparing the value of works physically has been finished (BCWP) and expenses which have been disbursed in the same period (ACWP). CPI value less than 1 shows bad performance of cost, since the disbursed expenses (ACWP) is greater that the earned value (BCWP).

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$$CPI = BCWP / ACWP$$

Schedule Peformance Index (SPI). Performance efficiency factor in finishing works can be seen by a comparation between works value phisycally have been finished (BCWP) and plan of disbursed expenses based on the works plan (BCWS). SPI value less than 1 shows that performance is not as expected since not able to achieve works target that has been planed.

$$SPI = BCWP / BCWS$$

Project Last Estimation. Estimation is not a real number, but it functions to give attention on the matter which will happen in the futureThus, it is possible, if needed, to do change to anticipate something unexpected so that the project will be finished successfully (Soeharto, 1999).

Estimate at Completion (EAC). There are several methods used to predict Estimate at Completition (EAC), one of them is calculating cost for works left (Estimate to Completition / ETC).

$$EAC = ACWP + ETC$$

ETC size, according to Soeharto (1999), can be extrapolated through approach as follows:

If works finishing is still under 50% so the works left will need cost as allocated, not depend on achievement that has been achieved until today, thus:

$$ETC = BAC – BCWP$$

In case of works finishing has been more than 50% during the reporting so the achievement hold is realistic enough to analyze work lefts (ETC), therefore:

$$ETC = \frac{(BAC – BCWP)}{CPI}$$

Time Estimate (TE). The entire time needed to finish work in a project can be estimated by assuming that the number trend of schedule performance (SPI) will last as in the reporting stage until the end of project.

$$TE = ATE + \frac{[OD – (ATE \times SPI)]}{SPI}$$

Where: ATE = *Actual Time Expended*; OD = *Original Duration*.

Analytic Hierarchy Process Method. Analytic Hierarchy Process (AHP) is a mathematics-based procedure which is very good and in accordance with evaluation condition of qualitative attributes.Those attributes are mathematically quantitative in a set of paired comparison. AHP strength compared to another is due to the existence of hierarchical structure, as the consequence of criteria chosen, until the detailed subs of criteria (Saaty, 1993).

Basic principle of AHP is based on the human basic principle in thinking analytically. Basic principle to think analytically is:

- Hierarchy formation;
- Priority Determination;
- Logical Consistency.

In order to determine the priority of each paired comparison is used an assessment system using scale. Every paired comparison is evaluated in Saaty's scale 1-9 as follows.

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	Most Important				Neutral				Most Important	
Elemen A	9	7	5	3	1	3	5	7	9	Elemen B

Scale used in AHP consists of 9 scales that have been set by Saaty (Saaty's scale) explained in the following table 1.

Table 1 – Saaty's Scale in AHP

Scale	Definitionof "Importance"
1	Equal Importance
3	Slightly more Importance
5	Materially more Importance
7	Significantly more Importance
9	Absolutely more Importance
2,4,6,8	Tentative between two adjacent values

Source: Saaty , 1993.

General Description of Community-Based Sanitation (SANIMAS). SANIMAS program is an extension of grant from government, as a form of initiative to promote the provision of infrastructure and facility of community-based settlement wastewater through need response approach.

The focus of SANIMAS program is household wastewater management. The application of Community-Based Sanitation lets society to chose facility and infrastructure of proper settlement wastewater, to form Community Voluntary Contribution Group (KSM), to actively arrange action plan and to do physical construction and to form a Group of Beneficiary and Keeper (KPP) to conduct management of operation and maintenance activity.

METHODS OF RESEARCH

Location and Time. The object of this research was construction project in 3 locations chosen based on the lowest physical advacement level (three lowest position) from the initial observation result conducted simultaneously at 10 locations of SANIMAS (DAK) program of the 2017 fiscal year in Malang District.The locations chosen were:

- Tunjungtirto village, Singosari Sub-district;
- Jeru village, Turen Sub-district;
- Wandanpuro village, Bululawang Sub-district.

SANIMAS activity lasts for 120 days, started in August until November 2017. The objects which would be observed are among others:

- Communal Waste Water Treatment Plants (WWTP) Construction;
- Offsite Waste Water Piping Network Construction;
- Supporting Component Construction of Offsite Waste Water Piping System like Grease Trap, Inspection Box, Manhole etc.

Data Collection Technique. Data collection tecnique used in this study was:

- Observation;
- Questionnaire spread;
- Documentation.

Step or stage which will be conducted in this study can be seen in the figure 1.

RESULT AND DISCUSSION

Community Ability Identification Related to the Understanding on the Basic Building Construction. This identification aimed at illustrating the concept of community-based project in which its project resource is society having understanding diversity about the basic building construction.

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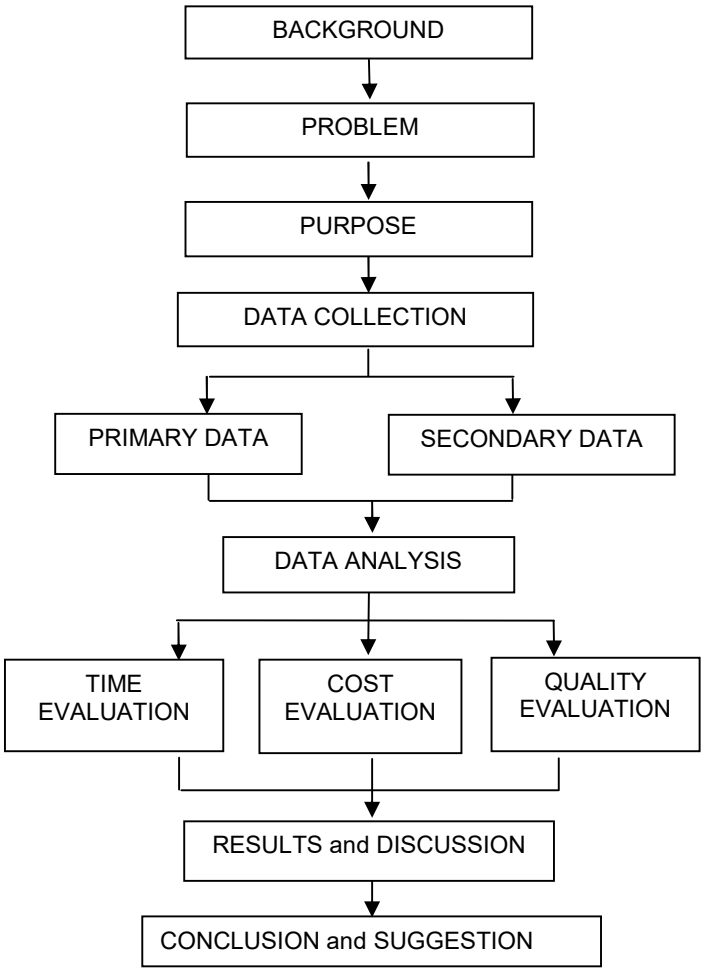

Figure 1 – Research flow chart

Respondents' answer description is a descriptive analysis used to illustrate respondents' answer towards 22 items of question as an indicator of basic understanding of building construction proposed by researchers using an average score of respondents' answer towards the question item.

To be able to fulfill qualification and quality as expected, minimum average score of each item of question is 3 (referring to the likert scale). Identification result of the three villages which become the research object is as follows:

Table 2 – Indentification Result of Indicator Mastery

Village	Total Indicator Mastery	Percentag of Indicator Mastery (%)
Tunjungtirto	7	31.82
Wandanpuro	6	27.27
Jeru	4	18.18

Table 3 – Identification Result of Worker Qualification

Village	Total Worker Fulfilling Qualification	Total Worker Not Fulfilling Qualification	Total
Tunjungtirto	4	7	11
Wandanpuro	5	5	10
Jeru	3	7	10
Total	12	19	31

That identification result implies that understanding level of society as the project worker is quites various and wholly only 38.8% fulfilling qualification related to the basic understanding of building construction.

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Evaluation Result Analysis of project Cost and Time Management Performance Using Earned Value Method. Earned Value Method was used to evaluate cost and time management performance of the project. That evaluation would be conducted between week 8 until week 10, before plan physical progress reaches up to 50% and between week 12 until week 14, before plan physical progress reaches up to 100%.

It was conducted in 3 villages chosen as the object of the research using a similar method. Earned Value Method (EVM) Calculation in one of the villages was as follows:

EVM Calculation in Tunjungtirto Village. Evaluation 1 was conducted in week 8 when planning physical progress reaches up to 40.57% like the planning arranged in the document of Community Plan Work (RKM). EVM calculation result in stage 1 in Tunjungtirto village can be seen in the following table:

Table 4 – EVM Calculation Result 1 in Tunjungtirto Village

Indicator	Value	Description
BCWS	Rp 120.371.907,18	40,57 %
BCWP	Rp 79.599.150,25	26,83 %
ACWP	Rp 88.983.500,00	
SV	Rp (40.772.756,93)	*Behind Schedule*
CV	Rp (9.384.349,75)	*Over Budget*
SPI	0,66	*Behind Schedule*
CPI	0,89	*Over Budget*
ETC	Rp 217.102.617,51	
EAC	Rp 306.086.117,51	*Over Budget*

Based on the table above, it can be counted the time estimation of works finishing (Time Estimated / TE) as follows:

$$TE = 8 + \frac{[16 - (8 \text{ X } 0{,}66)]}{0{,}66}$$

Evaluation II was conducted in week 14 when planning physical progress reached up to 91.92% like the arranged planning in RKM document. EVM calculation result II in Tunjungtirto village can be seen in the following table:

Table 5 – EVM Calculation Result II in Tunjungtirto Village

Indicator	Value	Desc.
BCWS	Rp 120.371.907,18	91,92 %
BCWP	Rp 79.599.150,25	55,74 %
ACWP	Rp 88.983.500,00	
SV	Rp (107.361.534,66)	*Behind Schedule*
CV	Rp 2.200.531,31	*Under Budget*
SPI	0,61	*Behind Schedule*
CPI	1,01	*Under Budget*
ETC	Rp 129.578.676,60	
EAC	Rp 292.753.776,60	*Under Budget*

Based on the table above, it can be counted time estimation of project finishing (Time estimated / TE) as follows:

$$TE = 14 + \frac{[16 - (14 \text{ X } 0{,}61)]}{0{,}61}$$

From the TE calculation 1 or 2, it gets estimation of project duration excessing time estimated, with the assumption of SPI until the end of permanent project in the similar trend so in order to return project duration to be accordance with the planning (16 weeks) so it should improve the performance.

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With the similar method was obtained TE in Wandapuro Village by 22 weeks in stage 1 and 24 week in stage II.While TE in Jeru village was 23 week in stage 1 and 25 week in stage 2. Based on the evaluation result, it can be known that those three villages get lateness and have a significantly low performance of time management.

Based on the real project implementation report, the three villages successfully completed their physical construction (100%) at 22 weeks with total delay in each village is 6 weeks.

Quality Evaluation Result Analysis of Work Output Using Checklist Assessment of Work Output. Quality evaluation of work output was done by observing building physical form visually (physical dimension) after construction process ended and making scoring in assessment checklist sheet. Component assessment in assessment checklist refers to:

- Community Work Plan Document;
- Implementation Guideline of SANIMAS DAK 2007;
- Regulation of the Minister of Public Works and People's Housing Number 04/M/PRT/2017 concerning Domestic Waste Water Management System Implementation.

Component assessed in assessment checklist is adjusted to the construction works item in the administering stage of SANIMAS like the RKM document, which is from preparing stage until finishing.While assessment scale using Likert scale with description like in table 6 below:

Table 6 – Likert Scale for Quality Assessment Checklist

Assessment	Score
Reelevance81 – 100%	5
Relevance61 – 80 %	4
Relevance41 – 60 %	3
Relevance21 – 40 %	2
Relevance 0 – 20%	1

Scoring result conducted in each village to 63 components assessed was as follows:

Table 7 – Quality Scoring Result of Work Output

Village	Component Total of Score < 5	Average Value of Total Score
Tunjungtirto	22	4
Wandanpuro	19	4.05
Jeru	19	4.3

Evaluation Analysis Result of Building Functions Using Work Output Test. Building functions evaluation of SANIMAS' facility and infrastructure was conducted through work output measurement (laboratory test and field trial phase). Laboratory test is in form of effluent quality standards test of Communal WWTP. While field trial phase in in form of stream speed measurement in piping system to assess the relevance of work output with the applicable standard.

Laboratory Test. Assessment was conducted by taking effluent sample in Communal WWTP outlet container container which was the analyzed in laboratory to know its quality on the quality standards of waste water. Effluent test result of each village can be seen in table 8, 9 and 10 below.

Table 8 – Eflluent Test Result of Communal WWTP in Tunjungtirto village

No	Parameter	Measurement	Result	Quality Satndards
1	pH	-	7.3	6 – 9
2	BOD	Mg/L	39.90	30
3	COD	Mg/L	143.6	50
4	TSS	Mg/L	12.9	50
5	Oil& Fat	Mg/L	< 1.9	10

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Tabel 9 – Eflluent Test Result of Communal WWTP in Wandanpuro village

No	Parameter	measurement	result	Quality Standards
1	pH	-	6.6	6 – 9
2	BOD	Mg/L	124.9	30
3	COD	Mg/L	363.9	50
4	TSS	Mg/L	20.1	50
5	Oil & Fat	Mg/L	< 1.9	10

Tabel 10 – Eflluent Test Result of Communal WWTP in Jeru village

No	Parameter	Measurement	Result	Quality Standards
1	pH	-	6.7	6 – 9
2	BOD	Mg/L	74.40	30
3	COD	Mg/L	194.5	50
4	TSS	Mg/L	30.5	50
5	Oil&Fat	Mg/L	< 1.9	10

From the table shown above, it can be seen that COD and BOD content on those three villages excess quality standards of waste water based on the Regulation of East Java Governor No. 72 year 2013 concerning Settlement waste water Quality Standards, Restaurants, Offices, Business, Apartments, Hotels and Dorms.

The high number of COD and BOD from the quality standards can be caused by several factors; among others the use of filter media in Communal WWTP still uses conventional media in form of volcanic stone.The use of volcanic stone filter has several deficiencies like the stone used has a greater volume with a pore which tends to be smaller. Since the media having more cavities, bacteria living in IPAL will easily grow.

In addition to filter media separation, bacterial grow of Escherichia Coli in Communal WWTP also has an influence on decreasing COD – BOD content. The higher the amount of E.coli in WWTP, the quicker the process of decomposition and vice versa. Bacteria buildups in WWTP itself needs more time to achieve an efficient amount, for that matter, it needs bacterial starter both chemical and organic. While the provision of bacterial starter in Communal WWTP in 3 villages was not conducted.

The problem of low number of bacteria can be overcome by giving bacterial starter both chemical and organic as well as continuous monitoring until COD and BOD are expected to be achieved.

Field Trial Phase. Assessment was conducted by calculating time needed by a ball streamed in a pipe from the innitial contril container point until the last point of control container.Testing was conducted along the main pipe with measurement distance of 100 m to decrease infiltration because of distribution change of flow rate in the pipe. The measurement was repeated 3 times for every side of control container and calculated its average value. The result of flow rate measurement in piping system conducted in each village can be seen in table 11, 12, 13 below.

Table 11 – Field Trial Phase Result in Tunjungtirto village

No	Route	Distance	Time	Speed	Speed Average (m/second)
		S (m)	t (dtk)	V (m/second	
1	A	93,70	237	0,40	0,39
		93,70	237	0,40	
		93,70	245	0,38	
2	B	83,70	215	0,39	0,39
		83,70	212	0,39	
		83,70	221	0,38	
3	C	92,50	215	0,43	0,41
		92,50	257	0,36	
		92,50	209	0,44	
4	D	66,80	275	0,24	0,25
		66,80	257	0,26	
		66,80	259	0,26	

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Tabel 12 – Field Trial Phase Result in Wandanpuro village

No	Route	Distance	Time	Speed	Speed Average (m/second)
		S (m)	t (second)	V (m/second)	
1	A	100	199	0.50	0.52
		100	195	0.51	
		100	187	0.53	
2	B	96	173	0.55	0.55
		96	169	0.57	
		96	180	0.53	
3	C	98	204	0.48	0.48
		98	206	0.48	
		98	203	0.48	
4	D	94	215	0.44	0.45
		94	204	0.46	
		94	206	0.46	

Tabel 13 – Field Trial Phase Result in Jeru village

No	Rpute	Distance	Time	Speed	Speed Average (m/second)
		S (m)	t (second)	V (m/second)	
1	A	91	205	0.44	0.44
		91	209	0.44	
		91	212	0.43	
2	B	96	172	0.56	0.56
		96	163	0.59	
		96	181	0.53	
3	C	94	197	0.48	0.47
		94	193	0.49	
		94	205	0.46	
4	D	84	186	0.45	0.45
		84	188	0.45	
		84	185	0.45	

The result of flow rate measurement obtains a speed average result of all points of flow rate test sample in the piping system of each village has a value under the standard of waste water flow rate referring to the Regulation of the Minister of PUPR Number 04/PRT/M/2017, which is minimum value of speed is 0.6 m/second and maximum speed is 3 meter/second.Moreover, the testing was conducted in the peak time which flow rate of waste water will tend to approach a maximum number.

There are several factors causing waste water flow has a speed under the minimum standard value. One factor indicated to be the reason was misplanning related to the determination of debit design leading piping system functions not optimal. This can be seen from the small size of waste water when conducting testing.

That planning mistake will have an influence on pipe diameter planning which will be used, since the needs calculation of domestic waste water pipe dimension is created to fit the debit in pipe flow. In its administering, the main pipe used has a bigger diameter from what needed so that the high flow in pipe only reaches one-fourth or 25% of pipe diameter only. Let alone, high flow within the pipe of peak debit in its planning assumed will reach up to 70-80% of pipe diameter.

The problem of low water discharge can be overcome by periodically flushing the inspection box to prevent pipe precipitation.

Problem Recapitulation Based on Data Analysis Result. Analysis result shows that the problems leading to the not optimal result which want to be achieved during the period of administering SANIMAS DAK activity of the 2017 fiscal year both from the side of time, cost and project quality (Tripple Constraint).

Based on the evaluation related to the performance of project implementation conducted at SANIMAS program in those 3 villages were obtained several problems as follows:

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- Project tardiness caused by the halted of project performance as a result of an error in the management of project financing;
- Project tardiness caused by time cancelation since deciding the day to do groundbreaking (local wisdom);
- Project tardiness due to the frequent alternation of worker since there was no good management in the allocation of project resources;
- Project tardiness caused by existing constraint that is the dense of settlement in the location;
- Project tardiness caused by the dugouts constraint of Communal WWTP which easily slide;
- Project tardiness caused by the elevation constraint of project existing which is relatively flat.

Project Financing Problem. Based on the evaluation of project cost control performance conducted in those 3 villages were obtained several problem as follows:

- Over Budget during the project administering was caused by an error in financing management;
- Cost efficiency happened was truly small so there was no budget left which can be utilized to support facility and infrastrcuture construction;
- Financing derrivating from community self-reliance is truly small compared to project budget allocated by government.

Quality Problem of Work Output. Based on the evaluation related to the work output quality conducted in the 3 villages were gained several problems as follows:

- There are several components of building whose form and size are not accordance with planning and the reference standard as the result of an error during the implementation;
- There is a missing implementation procedure;
- Field trial phase result has showen that thre has been a design error;
- Laboratory test result shows that Communal WWTP gets fail of building function demonstratng design mistake.

Root Cause Identification. From the result of problem recapitulation of each research object was conducted a grouping based on the root cause that leads the occurence of those problems.From that grouping was obtained 5 main problems as follows:

- The lack of time for project planning affects land readiness, RKM document readiness and the selection of construction design used;
- Design of activity planning is less detail and comprehensive to be made as a work reference (both from activity sheduling, financing, and building planning)causes the project implementation to be ineffective;
- The lack of competition of Human Resource (Government Supervisor, TFL, and society) causes the planning, implementation and quality of work output are not optimal;
- There is no management in allocating project resource especially the workers;
- The weakness of monitoring function both from TFL and Government Supervisor causes planning, implementation and quality of work output become not optimal.

Table14 – Alternative Solution

Main Problem	Alternative Solution
Problem 1	• Addition Of Planning Duration • Optimalization Of Community Self-Reliance
Problem 2	• Detailing Of Design And Activity Planning • Utilization Of An Up-To-Date Technology And Information
Problem 3	• Training For Actors For The Development Community • Training For Human Resource Of Field Facilitator (Tfl) • Training For Department Supervisor
Problem4	• Management in allocating project resource using Resource Leveling method
Problem5	• Addition Of Monitoring And Evaluation Instrument • Addition Of Monitoring And Evaluation Intensity

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Alternative Solution. Based on the root cause identification which has been conducted before, the next stage is alternative solution determination to overcome those problems through a realistic approach based on capability of each stakeholder by being supported by literature study or best practice of SANIMAS program which has been done in advance. Several alternative aolutions are among others can be seen in table 14.

Solution Priority Determination Using Analytic Hierarchy Process Method. The first step is compiling hierarchy structure consisted of grouped elements in a level started from one target/purpose in the peak level until solution alternatives in the lowest level. That hierarchy structure can be seen in this following figure.

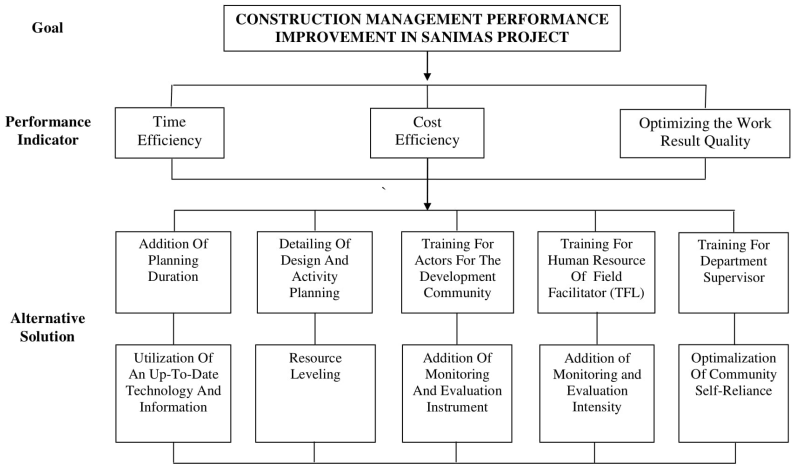

Figure 2 – Hierarchy Structure in AHP

The next stage is determining priority (weight) assessment of elements in every level using paired comparison through AHP questionnaire spread to 5 selected respondents to obtain assessment towards the importance level of one element to another.

After forming a comparison of each matrix, the next step was calculating value and consistency ration which can be obtained if CR value is more than 0.1 (≤ 10%).That calculation result shows the value or CR<0.1 at all paired comparison matrixes indicating that all assessments have been conducted consistently and weighing result can be received based on the consistency of filling.

The result of alternative solution priority compilation in achieving the purpose of Construction management Performance Improvement in SANIMAS program based on all performance indicators are as follows:

Table15 – Alternative Solution Priority

Alternative Solution	Criteria Weight	Priority
Duration Addition of Planning Time	0.038	10
Design Detailing and Activity Planning	0.115	4
Training for Actors for the Development Community	0.170	2
Training for Human Resource of Field Facilitator	0.191	1
Training for Department Supervisor	0.071	6
Utilization an Up-To-Date Technology and Information	0.055	9
Resource Leveling	0.058	8
Addition of Monitoring and Evaluation Instrument	0.092	5
Addition of Monitoring and Evaluation Intensity	0.145	3
Optimalization of Community self-reliance	0.064	7

Based on AHP result in table 15 above, it can be seen that solution alternative of training for Human Resource of Field Facilitator (TFL) is the first priority with the alternative weight of 0.191, while the last priority is the addition of Planning Duration with criteria weight of 0.038.

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CONCLUSION

Based on the evaluation conducted in this research, it is obtained some of points as follows:

- From the identification result of the worker ability , it is known that only 38.8% workers which meet the qualification related to the understanding of the basis of building construction;
- The result of EVM calculation shows that those three villages practice a tardiness and have a low performance of time management;
- Based on the assessment towards the result quality of work output in those three villages, it obtains building components whose form and size are not as planned;
- The result of effluent test shows that COD and BOD content of those three villages exceed the applicable of waste water quality standards;
- The result of field trial phase expresses that flow rate in piping channel of those three villages have a value under the applicable standard of waste water flow rate.

Based on that evaluation result, in terms of improing performance of construction management in SANIMAS program, solution alternative priority reccommended from AHP result is providing a training for Human Resource of Field facilitator (TFL). The main purpose of that training is to increase the competence of TFL in field of construction management related to its main task and function that is conducting a coaching and SANIMAS supervising.

SUGGESTIONS

In order to the further research on the improvement of construction management in community-based project, especially with a case study of SANIMAS activity, can be conducted more well so there are some suggestions as follows:

- It needs more sample of research object since the difference of the existing condiction and socio-culture in each location can bring a unique variation of a problem which will enrich data that can be used to the further analysis process;
- It needs to conduct measurement of self-competence of Human Resource of Field Facilitator and Department Supervisor to enrich data related to the quality from the human resource of development actor;
- Structural strength testing can be done to add data related to the quality of work output (special for Communal WWTP building);
- It needs to conduct a further study related to the impact (contribution) from the application of alternative solution priority resulted from this research towards construction management improvement in the community-based project, especially in SANIMAS program.

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REFERENCES

1. Kementerian PUPR. (2017). Petunjuk Pelaksanaan Dana Alokasi Khusus Bidang Infrastruktur Sub Bidang Sanitasi Tahun 2017.
2. Kementerian PUPR. (2017). Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat Nomor: 04/M/PRT/2017 Tentang Penyelenggaraan Sistem Pengelolaan Air Limbah Domestik.

DOI https://doi.org/10.18551/econeurasia.2018-10

3. Saaty, T. L. (1993). Pengambilan Keputusan Bagi Para Pemimpin, Proses Hirarki Analitik untuk Pengambilan Keputusan dalam Situasi yang Kompleks. Translated by Setiono L. Jakarta: PT.PustakaBinaman Pressindo.
4. Soeharto, I. (1999). Manajemen Proyek (dari konseptual sampai operasional). Jakarta: Erlangga.
5. Stufflebeam, D. L. (1971). Educational Evaluation and Decision Making. Four Printing. Itasca Illinois USA: F. E. Peacock Publishers, Inc.
6. Umar, H. (2002). Evaluasi Kinerja Perusahaan. Jakarta:PT. Gramedia Pustaka Utama.
7. Widiasanti, I., &Lenggogeni. (2014). Manajemen Konstruksi. Bandung: PT. Remaja Rosdakarya.