

Analysis Of Implementation Green Infrastructure Of Bregas Regional Water Supply System

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Abstract. The eco-friendly drinking water supply system (Green WSS) is an important issue in Indonesia's development related to the low implementation of Green WSS in existing water supply building. While the current water supply system development criteria should have more efficient and eco-friendly infrastructure. This study aims to assess the implementation of Green WSS on Bregas Regional Water Supply System. Regional Water Supply System service areas of Bregas include Brebes Regency, Tegal City, and Tegal Regency with total discharge of 650 L/sec will be able to serve 52.000 connection house or some 260.000 people. Analysis method that used in this research is scoring analysis of Green WSS indicator and SWOT analysis, data collection obtained by interview, observation, and document study related to planning phase, construction phase, and operational and maintenance phase. According to the results of scoring analysis Green WSS indicator, Bregas Regional Water Supply System has a score of 264 out of 285 (green category) and based on SWOT analysis, it is in quadrant II, meaning the implementation of Green WSS shows the average condition. From those condition have been formulated 13 management strategies of Bregas Regional Water Supply System.

Keywords : green water supply system; Bregas water supply system; SWOT analysis

1 Introduction

Sustainable development is a mindful and planned effort that combines environmental, social and economic aspects into a development strategy to ensure the integrity of the environment also the safety, abilities, welfare, and quality of life of present and future generations [1]. One of the efforts in realizing sustainable development is by carrying out development on the Drinking Water Field.

This study will review the fulfillment of clean water in Central Java Province and the need for implementation of Green WSS at Regional WSS in Central Java (Case Study Of Bregas Water Supply System). Implementation of Green WSS in Regional WSS covers the application of green open space in the all of water plant building, utilization of renewable energy source (green energy), low carbon and the effort of developing energy-saving and green building in water treatment plant, in its planning stage, construction stage and operational stage.

It is expected that with the implementation of Green WSS on Regional WSS development in Central Java can improve drinking water service followed by significant economic development.

2 Literature Review

Drinking Water Supply System hereinafter abbreviated as WSS is a unity of facilities and infrastructure of drinking water supply.

WSS type consists of WSS pipeline network and WSS not pipeline network. WSS pipeline networks include raw water units, production units, distribution units, and service units, while WSS not a pipeline network consisting of shallow wells, pump wells, rainwater catchment basins, water terminals and water catchment buildings.

The implementation of WSS is held to ensure people's right to drinking water, access to drinking water services and fulfill the daily basic needs of drinking water for the community.

The regional system in the implementation of WSS development refers to the second Master Plan namely the WSS Master Plan Development across Districts and/or Cities. The Master Plan is established by the Governor with the support of the Joint Decree of the respective regional head.

In the case of availability of raw water, the Central Government and the Regional Government shall ensure the availability of raw water. Central Government and

Local Government can do cooperation between regions in the framework of raw water utilization efficiency.

Green WSS is an important issue in development in Indonesia due to the low level of green WSS implementation on existing water supply building. Basically, the application of Green WSS cannot be separated from green construction which is the basic step of indicator to produce green building.

Green building is a concept for 'sustainable building' and has certain conditions, namely location, planning and design system, renovation and operation, which adheres to the principle of energy saving and must have positive impact for environment, economy and social (Ministry of Environment, 2001).

In planning of WSS buildings, green building begins at the planning, development, operation and maintenance operations with pay attention to aspects of protecting, saving, reducing the use of natural resources, maintaining the air quality in the room and pay attention on the occupants health.

In this study, Green WSS is a sustainable movement that aspires to create green building from the planning, construction and operational & maintenance phase. In order to realize the movement, an assessment indicator is required in each phasing. Determination of indicators at the planning stage, construction phase, and operational & maintenance stage includes 5 aspects, namely technical aspects, laws and regulations, institutions, social, and finance.

3 Research Methods

3.1 Identification Of Green Water Supply System Indicators

An indicator is a variable that can be used to evaluate the situation or the possibility of measurement of changes occurring over time. An indicator does not always explain the situation as a whole but often gives only a hint or indication of the overall state as an estimate. Indicators must be simple, timely, measurable, useful, and reliable.

This analysis will discuss the current condition of Bregas Regional Water Supply System with reference to 3 stages of Green Water Supply System indicator covering technical, legal and regulatory, institutional, , financial and social aspects. Each indicator consists of several ratings containing credit that has a certain value charge and will be processed to determine the final value. In the selection of issues and indicators that will be used has been conducted site survey based on the real situation to obtain the following indicators:

From Green Water Supply System indicator above, then will be analyzed by means of assessment of each answer on each substance has been determined, namely:

- a) score 1-5 if it supports Green WSS (according to rating that have a predetermined value charge)
- b) score 0 if it does not supports Green WSS

Examples:

If there has a Feasibility Study (FS) document, then it is stated support Green WSS, then by category:

- Complete Feasibility Study, score 5

- Feasibility Study Simple, score 3

- Technical and cost justification, score 1

Based on the considerations, to determine whether a building can be stated to have eco-friendly building criteria, the final result of scoring indicator analysis has a total scoring value of ≥ 75 of 100% total.

3.2 Methods Of Data Collection (Documents, Interview, Survey)

Data collection techniques implemented include:

- a. Observations
Collecting data by conducting direct observation to the object or research location to get a clear picture of the object under study.
- b. Interviews
Implemented with in-depth interviews conducted to the parties who are competent and have a fairly good knowledge in formulating strategies in the Water Supply Program in Central Java, especially Bregas.
- c. Literature Reviews
The literature study is the activity of collecting various supporting data including study and research reports, scientific publications, laws, maps and other forms of publication related to the research.

3.3 Methods Of Data Analysis (Indicators Scoring, SWOT Analysis)

Data analysis methods is an attempt done by grouping data, finding patterns, finding what is important and what is learned and deciding what can be told to others (Bogdan & Biklen, 1982) [1]. In the analysis phase, the data obtained will be processed in accordance with the grouping.

Tabel 2. Data Analysis Method

DATA INPUTS	PROCESSES	RESULTS
Describe and analyze the implementation of Green WSS on Bregas Regional WSS	1. Assessing the implementation of Green WSS on Bregas Regional WSS technology 2. Assessing the impact of Green WSS implementation on technical, regulatory/legal, institutional , financial and social aspects	Obtained the description of Green WSS implementation analysis on Bregas Regional WSS covering 5 aspects. Obtained the Green WSS indicator scores on the Bregas Regional WSS

Source : Processed data, 2018

SWOT analysis is described descriptively from the observation data and manager interviews analyzed based on Green WSS criteria. Qualitatively, SWOT analysis is used in analyzing internal and external factors to formulate existing strengths and weaknesses, as well as

the opportunities and threats that must be faced. Quantitative analysis in SWOT is done by giving weight and rating so as to produce SWOT matrix (David, 2009)^[12].

4 Result And Discussion

4.1 Indicators Skoring of Green Water Supply System

From the results of the analysis that has been implemented, the scoring of indicators obtained in each aspect that has been determined. For more details can be seen in the table 3.

From the results of the above analysis, the total value of 5 aspects of Green WSS indicator is 264 out of 285 or 93% indicating that Bregas Regional Water Supply System Infrastructure into the Green category.

Classification of Green WSS Indicators Value

0-56	(0-20%)	: Black
57-113	(20-40%)	: Red
114-170	(40-60%)	: Blue
171-227	(60-80%)	: Yellow
228-285	(80-100%)	: Green

Tabel 3. Green WSS Scoring Indicator of Bregas Regional Water Supply System

No	Stages	Indicators	Scoring
	Technical Aspects		
1	Planning Stages	The availability of Water Supply System Master Plan (RI-SPAM)	4
		The availability of Feasibility Study	5
		The availability of <i>Detailed Engineering Design</i> (DED)	5
		The availability of Environment Permit Documents (Amdal/UKL-UPL)	5
2	Construction Stages	The suitability of land use in the field, is it in accordance with the planning?	5
		The suitability of the system in the field, is it in accordance with the planning?	4
		The use of building materials, harmful to health and the environment or not?	5
		Energy use	3
		Waste management	4
		Environmental damage	5
		Implementation of Health and Safety Management System	4
3	Operational and	Quantity, quality and continuity of WSS including water leakage	4

	Maintenance Stages		
		Energy use	5
		Waste management	5
		Environmental damage	5
		Implementation of Health and Safety Management System - Standard Operating Procedure - Work tools standard	4
		Efforts of the managements parties related to water conservation	5
	Total		77
	Legal Aspects		
1	Planning Stages	Availability of national regulations on Regional WSS	5
		Availability of Bregas Regional WSS specific regulations	5
		Availability of direct institutional regulations	5
2	Construction Stages	Standart Operating Prosedure (SOP) application	5
		Suitability with technical specification	5
		Occupational Health and Safety application	5
3	Operational and Maintenance Stages	Availability of Standard Operational Procedures document	5
		Availilty of Occupational Health and Safety document	3
	Total		38
	Institutional Aspects		
	Planning Stages	Support from the government	5
		The existence of institutional who manages the WSS	5
		The existence of institutional who responsibilities the WSS	5
		The existence of official supervision institutional	5
	Construction Stages	Contractor criteria	4
		The existence of field supervisor	4
		Coordination with planning construction	5
		Involvement of the managing candidate	5

		Involvement of other stakeholders	5
Operational and Maintenance Stages		PDAB organization structure	5
		Organizational structure of Bregas Regional WSS	5
		Bregas Regional WSS special supervision institutional	4
		Stakeholder and community involvement	5
		Total	62
Financial Aspects			
Planning Stages		Survey of local unit price or government price	5
		Analysis of construction costs as per the needs of the field or not	5
		Investment costs	5
		Funding costs lighten the management or not	5
		Financial feasibility	5
Construction Stages		Suitability with investment costs in DED	5
Operational and Maintenance Stages		Operational cost	5
		Tariff	5
		Total	40
Social Aspects			
Planning Stages		Socialization to the community	5
		Special approach to society	4
		Community involvement in design planning	3
Construction Stages		Socialization ahead of construction	5
		Local people involvement in construction processes	3
		Disruption from residents during construction progresses	5
		Involvement of CSR	4
		Supervision from the community	5
Operational and Maintenance Stages		Socialization ahead of operational activities	3

		Involvement of residents in operational activities	5
		Disruption from residents during operational	5
		Sub Total	47
		Total	264

Source :Analyzed, 2018

4.2 SWOT Analysis

This matrix function is to measure how big of internal and external factors role in Green WSS Implementation and Bregas Regional WSS. Based on the weight value in internal and external factors are made IFE and EFE matrixs.

Table 8. Matrix of Internal Factors Evaluation (IFE)

Internal Factors	weight	Rating	Score
	1	2	3
Strengths			
Raw water quality (Springs)	0,126	3,4	0,431
The commitment of Local Government in realizing WSS development program	0,131	3,1	0,411
Special Regulations of WSS Regional	0,126	3,4	0,431
The desire from people to get clean water service	0,121	3,1	0,379
The participation from community in the implementation of WSS	0,116	1,9	0,215
Weakness			
The cost of investment is huge	0,126	3,0	0,377
Pipeline system / path is prone to leakage due to passing fault areas (bad topography)	0,126	2,9	0,359
There are still untapped water sources	0,131	3,0	0,392
			2,99

Source :Analyzed, 2018

Table 9. Matrix of External Factors Evaluation (EFE)

External Factor	weight	Rating	Score
	1	2	3
Opportunities			
The first Regional Water Supply System in Central Java	0,173	4,0	0,691
Budget opportunities from the Central Java Government	0,142	2,9	0,406
Special management agency	0,154	3,6	0,551

External Factor	weight	Rating	Score
	1	2	3
The participation of society	0,123	2,4	0,300
Threats			
Operational and maintenance technical more difficult due to topography factor	0,160	3,3	0,527
Operational and Maintenance costs are big because the system is easy to leak	0,167	3,3	0,548
Social Conflicts	0,080	1,9	0,149
			3,17

TOTAL WEIGHT SCORE IFE

	4	3	2	1
	Strong 3,00 - 4,00	Strong 3,00 - 4,00	Medium 2,00 - 2,99	Weak 1,00 - 1,99
4	I	II	III	
3	IV	V	VI	
2	VII	VIII	IX	
1				

5 Conclusion

Based on the data analysis and discussion that has been done in this research obtained the following conclusion:

1. Identification Result Of Green Water Supply System Indicators
 According to the results of scoring analysis Green WSS indicator, Bregas Regional Water Supply System has a score of 264 out of 285 (green category).
2. SWOT Analysis
 SWOT analysis, it is in quadrant II, meaning the implementation of Green WSS shows the grow and build condition.

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References

1. Z. Ding, Z. Fan, V.W.Y. Tam, Y. Bian, S. Li, I.M.C.S. Illankoon, S. Moon, Build&Env, *Green Building Evaluation System Implementation*, **133**, 32-40 (2018)
2. X. Huo, A.T.W. Yu, Z. Wu, Cl.Prod.J, *An Empirical Study of The Variables Affecting Site Planning and Design in Green Buildings*, **175**, 314-323 (2018)
3. L.O. Ugur, N. Leblebici, Ren&Sus En Rev, *An Examination of The LEED Green Building Certification System in Terms of Construction Costs*, **181**, 1476-1483 (2018)
4. R. Liu, T. Wei, Y. Zhao, Y. Wang, Chem Eng J, *Presentation and perspective of appealing Green Facilities for eco-cyclic water managementI* (2017)
5. R.C. Marques, N.F. da Cruz, J. Pires, Env Sci & Pcly Measuring The Sustainability of Urban Water Services, **54**, 142-151 (2015)
6. Carter et al. J. Sci. Food Agric., **79** (11): 1431-1440 (1999)
7. Bogdan, Robert C. and Biklen Kopp Sari, 1982, *Qualitative Research for Education: An Introduction to Theory and Methods*. Allyn and Bacon, Inc.: Boston London.
8. David, Fred R. 2009. *Strategic Management: Manajemen Strategis Konsep*. Edisi 12. Jakarta: Salemba Empat.
9. Glavinich, T. E., 2008, *Contractor's Guide to Green Building Construction*, John Wiley.
10. Kusmayadi & Sugiarto, E., 2000, *Metodologi Penelitian dalam Bidang Kepariwisataaan*, Jakarta: PT. Gramedia Pustaka Utama.
11. Mukherjr, N & C. van Wijk, 2003. *Sustainability Planning and Monitoring in Community Water Supply and Sanitation : A Guide on the Methodology for Participatory Assessment (MPA) for Community-driven Development Programs*, Water and Sanitation Program, World Bank and IRC, The Netherlands
12. Purnomo, Wika D. 2013. *Evaluasi Pengelolaan Lanskap Berdasarkan Aspek Tepat Guna Lahan Bagi Bangunan Hijau di P.T. Dahana*, Bogor : IPB