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Strategy Of Boezem Development Towards Water Sensitive City In Surabaya City

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ABSTRACT

A water senstive city is an ideal city concept in the future that is able to manage its water resources so that it becomes a productive city and has resistance to flood disasters. The city of Surabaya is one of the flood cities that has a boezem as a flood control and rainwater storage. This study aims to examine the potential of boezem water which can be used as an alternative water source and determine strategies in developing Boezem as an effort towards a water sensitive city. The Boezem being researched is the largest boezem in each area of Surabaya City with a capacity of above 50,000 m^3. This research processes water quality, rainfall, climatology, and land use data to see water availability, then is processed using the Mock method to determine evapotranspiration and available water volume. Interview analysis conducted on boezem managers used a SWOT analysis to determine a boezem management development strategy. The results show that the highest available discharge in Boezem Kedurus, Boezem Bratang, and Boezem Slamet is 8,235 m3/sec; 0.434 m3/sec; 0.024 m3/sec. Boezem Kedurus can supply the total water demand planned throughout the year. The current condition of boezem management carried out by the Department of Public Works Highways and Drainage Surabaya is not in accordance with Minister of Public Works Regulation No. 12 of 2014 concerning the implementation of urban drainage systems. To develop boezem management, the initial strategies that need to be taken to get to a water sensitive city include scheduling equipment maintenance and boezem complementary buildings and documenting all activities related to boezem management.

Introduction

Boezem is a water reservoir system that has the same function as a reservoir. Boezem was built because the city of Surabaya is a flood-prone city. The collected rainwater is not utilized. The utilization of boezem by the Surabaya City Government is focused on flood control infrastructure. Where when the intensity of rain is high, the water collected in Boezem will be immediately flowed into the sea with a pumping system (Maulidiyah, 2017). Boezem as water storage certainly has the potential as a source of water reserves that can be utilized by the government and the community if managed properly. There are several boezem with a capacity of more than 50,000 m^3 spread across the city of Surabaya, namely Boezem Kedurus, Boezem Slamet, and Boezem Bratang.

The city in the future must have optimal water resource management to become an ideal city. The concept of an ideal city is a water senstive city which is a productive city, comfortable to live in and resistant to flood disasters. The city of Surabaya is not currently a water sensitive city To become a water sensitive city, there are 3 (three) pillars that must be owned by the City of Surabaya, namely a city that can provide water supply for its region, a city as a provider of good environmental services, and a city with government and people who care about water (Brown and Wong , 2009).

Research Method

The condition of the area is based on the location of the Boezem area, which is not adjacent to the sea and the volume of the Boezem holding capacity is above 50,000 m^3. From secondary data and direct field observations, it is known that the appropriate boezem is Boezem Kedurus which is the largest boezem in the South Surabaya area with a storage volume of 717,500 m^3. Boezem Slamet which is the largest boezem in West Surabaya with a storage volume of 200,000 m^3. Boezem Bratang which is the third largest boezem in East Surabaya with a volume of 59,700 m^3. The stages carried out in this research are:

- *Data collection*
- *Calculation of boezem water services requirements*
- *Calculation of Water Availability*

Evaporation

$$ET_0 = C \times ET_0^*$$

Mock Simulation

The Mock model simulates rain data into flow rate data using equation :

Basic Flow (BF) = Infiltration(I) – volume of waterflow (ΔVn)

Surface flow (DRO) = Excess water (WS)- Infiltration (I)

Flow (RO) = basic flow (BF) + Surface flow (DRO)

River Discharge = (flow x catchment area)/1 month in sec

Dependable Flow

To determine dependable flow :

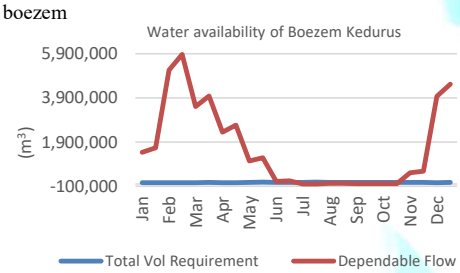
$$P = \frac{m}{\eta+1} \times 100$$

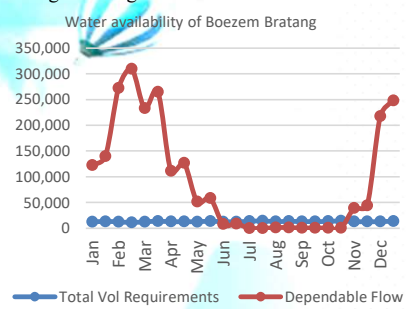
The amount of effective rainfall for rice plants is taken as 70% of the 80% dependable rainfall (R80) using equation.

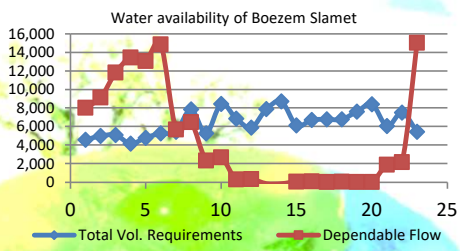
$$Re = 0{,}7 \times \frac{1}{h}(R_{80})$$

Results and discussion

Boezem water quality, which is classified as class 4 according to PP 82 of 2001, can only be used to supply irrigation water, fire fighting, and green open space. Water balance analysis is related to water consumption and water availability in the reservoir. Water balance analysis aims to determine the water in the reservoir with dependable flow whether it can supply water demand. Calculation of water balance is done by simulation demand for irrigation water, green open space, firefighters and evapotranspiration based on dependable flow of 80%. From the simulation results, it is known that the difference between water supply and demand illustrates the condition of water availability in the study area, if the difference between the two is positive, then the condition of water availability is **surplus** and if the difference between the two is negative, the water availability condition is **deficit.** The following is a diagram of the water balance in each boezem



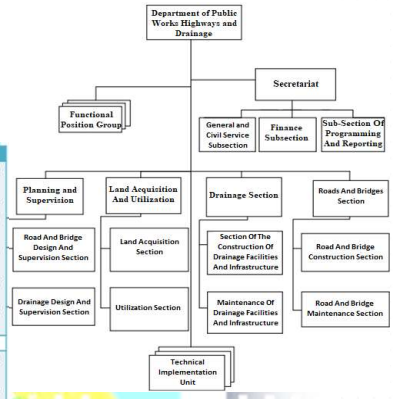




The organizational structure of the Department of Public Works Highways and Drainage Surabaya as the agency that handles Boezem is in accordance with Government Regulation No. 41 of 2007 concerning the organization of regional apparatus. However, the maintenance carried out by the drainage sector is not in accordance with the Regulation of the Minister of Public Works Number 12 of 2014 concerning the implementation of the urban drainage system.

Efforts to increase the utilization of Boezem to become a multifunctional infrastructure require a good, effective and efficient strategy. The formulation of a strategic plan will be carried out after an analysis of the current conditions. In this study, the strategic plan uses the SWOT analysis which is shown in table below.

Analysis of the SWOT Matrix Strategy SWOT Matrix	Weakness (W)
	1. Water quality is classified as class IV on standard surface water quality 2. There is no documentation of the institutional structure in the Boezem secretariat 3. There is no maintenance of boezem auxiliary buildings 4. The boezem complement building has suffered some damage 5. The quality of human resources is still not good enough
Opportunity (O)	**Strategy (W-O)**
1. There is a desire for community involvement in boezem maintenance **2. There is financial support from the city government regarding the management of Boezem** **3. The potential for boezem water utilization to meet the distribution of water for irrigation, fire fighting, and green open space**	1. To socialize about waste treatment to the public 2. Scheduling maintenance of boezem equipment and auxiliary buildings 3. Documenting all activities related to Boezem management 4. To provide guidance for supervisors by including education and training in the field of Urban Drainage System Administration



Departement of Public Works Highways and Drainage Organization Structure

Kesimpulan

Boezem with a volume capacity above 50,000 m3 could potentially be an alternative water source for the City of Surabaya. Based on the results of this study, known that Boezem can supply the demand for irrigation water, fire fighting water distribution, and green open space. Development of Boezem towards a water sensitive city of Surabaya requires the role of the government which is the manager of Boezem. The initial stage that demands to be carried out by the Boezem manager is to schedule maintenance of tools of Boezem and to document all management activities. Thus, the city of Surabaya can implement a water sensitive concept through the utilization of Boezem as a multifunctional infrastructure.