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TECHNICAL AND COST ANALYSIS ON FLOOD CONTROL PLANNING WITH ECODRAINS-BASED SPONGE VILLAGE MODEL IN DAS KAMONING SAMPANG

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Abstract

The Kali Kamoning Watershed in Sampang Regency, spanning 35,421.15 Ha, experiences annual major floods affecting Sampang City. Despite various attempts and budget allocations at different administrative levels, flooding remains a persistent issue. A proposed solution is the implementation of an Ecodrains-based sponge village model for flood control, specifically targeting upstream areas like Karang Penang, Robatal, Kedungdung, Omben, and Sampang sub-districts. The model, cost-effective and easy to construct, utilizes the HEC-HMS software for technical analysis, simulating river capacity and calculating flood reduction. The sponge village model demonstrates a substantial reduction of flooding by 73.14%, equivalent to 326.3 m3/sec. The Q25th flood discharge measures 446.1 m3/sec. Estimated construction costs using the SNI method amount to IDR 917,588,260,000, aiming to control the Q25th flood. This innovative approach offers a promising strategy for mitigating flooding in Sampang City through sustainable watershed management and cost-efficient infrastructure development. Key terms: Watershed, Flood Reduction, Ecodrains, Sponge Village Model, HEC-HMS, Q25th, Construction Costs.

Keywords: *DAS, Flood Reduction, Costs, Sponge Village Model*

1. INTRODUCTION

Every year during the rainy season, the Sampang City area is inundated by flooding problems caused by the overflow of the Kemoning River that crosses the Sampang City District. The overflow of flood water occurs because the capacity of the river in the city cannot accommodate the discharge of the delivery water flowing from the upstream area to the downstream so that the Sampang City area located in the river with a lower topography and elevation is inundated by flood water. Almost the entire southern part of the Sampang regency area is categorized as very prone to flooding and for Sampang sub-district which is a city sub-district with details of 17 villages/sub-districts categorized as very prone to flooding and 1 village categorized as quite prone based on the distribution of the slope of the southern area of the southern region which tends to be flat and low so that it has the potential to become a water reservoir when rain occurs which results in flooding (Darmawan and Suprayogi 2017).

Several major flood events were recorded, namely in 1980, 1991, 2002, 2013 and 2016. On April 23-24, 2013, the Sampang Regency Disaster Management Agency recorded that the value of flood losses and damages (Damage And losses Assessment) reached 28 billion, flood inundation reached a height of 3 meters from the ground. in Every year in Sampang city sub-district there can be at least 3 floods and even 23 floods. In 2017 there were 4 floods and at the beginning of 2018, precisely on January 06, 2018, January 10, 2018 and February 12, 2018 there were 3 floods that inundated the city of Sampang, On January 01, 2023 there was also a fairly large flood in the city of Sampang (BPBD, 2023).

The Sampang Regency Government in solving flood problems has made efforts in various flood control programs both upstream, midstream and downstream, flood control activities carried out upstream, namely through the construction of flood control reservoirs placed in the upstream area, the middle of the kemoning watershed in tributaries until now 88 points of flood control reservoir buildings have been built which aim to inhibit and control flood discharge in the upstream area spread across 4 sub-districts, Robatal sub-district, Kedungdung sub-district, Karang Penang sub-district and Omben sub-district from 2008 to 2021, in addition there is also the construction of reservoirs in tributaries that function to collect rainwater during the rainy season and other supporting programs, namely the construction of riverbanks and riverbanks, gabions are also carried out in several tributary areas as cliff reinforcement in reducing landslides and maintaining the dimensions of tributaries including the construction of sheet piles in the Sampang City river. However, the frequency of flooding has not decreased and the river water discharge or flood discharge is still high and has not decreased while not a small amount of money has been spent by the Regional Government of Sampang Regency and the East Java Provincial Government.

Physical activity programs (projects) that have been built in the downstream area (in Kota sub-district) are normalization activities, construction of secondary drainage (box culvert), construction of flood water pumps at five points in sampang city including the floodway construction plan (sudetan) which aims to divide the flood discharge that will enter sampang city. The development process downstream (in the city) is carried out in order to increase the capacity of the existing Kamoning river in the city so that it is expected to reduce the frequency of flood events that occur in Sampang Sub-district. The construction of a floodway (sudetan) which is planned to be able to accommodate river capacity up to a flood discharge of 423 m3 / s is still in the stage of land acquisition along 7 km x 70 meters with a wet river cross section width of 35-40 meters into a long-term program and has not been realized.

With the above flood problems that have not been resolved in this study will be carried out by means of a new method to overcome the flood problem which has become a strategic issue for years of the Sampang Regency Government through an ecodrainage-based sponge village model along with cost analysis calculations using the Indonesian National Standard (SNI) method so that the budget required in realizing the program is known.

The capacity of the river is exceeded due to the amount of surface runoff that joins the flow of water delayed in the basin (channel) and subsurface flow, then the flood disaster occurs ((watervoorziening.) 2004). Therefore, efforts to reduce flood discharge through the ecodrainage system by changing land functions and soil properties in the village so that it has a high infiltration capacity or has a high absorption capacity and minimizes surface runoff during the rainy season, so that this type of flood control is to control the rainfall ecosystem from its source (Zhang, Zhao, and Tong 2016).

The Ecodrainage system is an environmentally friendly drainage concept by maximizing the potential for absorption of runoff and excess water into the soil by changing the spatial pattern or land function in the village located in the watershed in the

Kemoning watershed which becomes a chatchment area or rain catchment by maximizing the capacity and rate of infiltration so as to reduce rainwater runoff leading to tributaries / rivers. With the planning of this sponge village model, it will help the function of macro physical activities of the Project of making reservoirs and reservoirs in flood control that have used a lot of budget costs. The combination concept is expected to optimize the reduction of flood potential due to high rainfall in the watershed area (DAS) including in the Kamoning Sampang river, to be more efficient in the use of the budget.

Flooding incidents that occur in the city of Sampang due to excess surface water runoff in the Kamoning watershed have been overcome and not a little cost has been incurred by therefore with the ecodrains-based sponge village development model is expected to reduce flooding as effectively as possible with the most efficient cost possible. Based on the above background, this study aims to calculate the flood reduction value of the ecodrainse-based sponge village model flood control in the Kamoning Sampan watershed, analyze the costs required in the construction of flood control with the ecodrains-based sponge village model in the Kamoning Sampang watershed.

2. RESEARCH METHODS

The subjects of this study consisted of 51 villages in the Kamoning watershed area which included locations on 3 land uses, namely land on moorland for planting crops, paddy fields for planting injection wells and residential land for planting. It is known that the area of each sub-district in the Kamoning watershed area of Sampang Regency consists of 5 sub-districts. The object of this research is the type of ecodrainage construction and also the budget cost of sponge village development, which sponge village development consists of 3 elements of ecodrainage construction including vegetation planting, infiltration well construction and injection well construction.

The Research Instrument consists of a generalization area consisting of objects / subjects that have a certain quantity (number) and characteristics (characteristics) set by researchers to study and then draw conclusions (Sugiyono 2013). simply put, the population is the object / subject of research targets (Sukmana 2015). The sample is part of the population, there are 4 factors that must be considered in determining the sample size in a study, namely: The degree of uniformity of the population, the more uniform the population, the smaller the number of samples that can be taken The desired precision of the research, the higher the desired precision, the greater the number of samples that must be taken.

Population and sample determination from field and laboratory tests in the research area focused on the Kemoning River watershed area, the Kemoning River watershed consists of 50 villages, in 5 sub-districts, with a watershed area of 35,421.15 Ha or 354.421 Km2, details of the names of villages in the Kamoning watershed are presented in table 3. 1 The number and area of villages in the Kamoning watershed, these villages will be adjusted to the river flow route based on the Kemoning sub-watershed, so that the Kemoning watershed will have many sub-watersheds as an input of rainwater runoff that converges on the Kamoning Main River, so there will be many branches (Juction and Reach).

Data collection consists of primary data and secondary data, primary data is taken from the results of field observations, field data collection or field surveys, primary data is also obtained from the calculation of the budget value of the construction cost of vegetation plants, budget costs for the construction of infiltration wells and also the calculation of the value of the budget debit runoff cost, Including new data that must be taken when secondary data is incomplete or there are many discrepancies between the field and existing data (inaccurate) such as data on the results of analyzing the needs of construction types such as the depth of the well or the number of wells in 1 village and the area of vegetation, primary data includes data from interviews with resource persons either in the village or stake holders in related agencies.

Secondary data obtained from technical agencies, data from villages, sub-districts such as land area, land use in the village, kemoning watershed map, rainfall data, taken from rainfall data from the measurement of rainfall measuring stations in sampang district, data on crop types, agricultural land area and residential land area. data required through related agencies.

The data analysis technique is done by analyzing the sponge village model of flood reduction capability and to get the ideal type of construction, for example, how much vegetation is needed, then the type of injection wells into and the number of units needed, after meeting the total needs that can reduce flooding, the financing analysis of the results of the alternatives that have been carried out to find out how much it costs to implement the sponge village with ecodrainage, calculation in terms of cost or economic value, calculated from tree planting patterns, implementation of infiltration wells / Injection Wells, The financing aspect is analyzed by NPV and BCR methods. This financing aspect can also consider the costs that should be incurred by the local government for land conservation compared to the cost of making physical construction that must be issued by the government in overcoming floods such as the cost of making sudetan or normaliasasi.

3. RESULTS AND DISCUSSION

3.1. Cost Budget Requirement

The results of the budget calculation of sponge village development needs in 51 villages 6 kelurahan will be compared with the government plan that plans to make Floodway or Sodetan (new river) from central government funds, floodway aims to increase the capacity of the sampang river. Planning for a return period of Q25 years, the idea of the proposed sodetan development plan began planning since 1991 until the current year the progress is still in the stage of land acquisition plan.

3.1.1. Planting Cost (Reforestation/Greening)

From the results of the analysis of the need for plant / vegetation area in the previous section, it is known that the amount of existing forest land planted with plants in the Kamoning watershed area is 3,530.76 ha, or an area of 9.97% (almost 10%) of the watershed area, from the analysis of HEC-HMS scenario 3 (40% vegetation) obtained the Optimum condition of vegetation / forest area of 38.61% or an area of 13. 674.79 ha of vegetation, so that the need for vegetation (plants) in the Kamoning watershed that must be reforested or greening (planting) plants is 13,674.79 ha - 3,530.76 ha = 10,144.03 ha.

This area will be divided into 51 villages. 6 villages for planting plants in the form of reforestation or reforestation in the Kamoning watershed.
In general, the need for planting plants for reforestation and reforestation in the Kamoning watershed area consists of the following costs

1. Material purchase costs consist of: The cost of purchasing seeds, purchasing fertilizers, purchasing stakes, the cost of herbicide drugs, spraying (especially at the beginning of planting in the dry month).
2. Wage costs/field activities consist of land clearing, making plant holes, pre-plant fertilization and seedling planting and spraying.

The following is the cost budget for planting fruit trees with the assumption that the planting distance is 5 x 5 m, the height of the plant is also assumed to vary in tree height between 1.5 m and 2 m. for each planting of 100 m x 100 m or per 1 hectare of plants The budget plan for planting crops is contained in the appendix of this study. with an example of the Budget in Gunung eleh village, Kedungdung Kec. Sampang Regency. The crop planting cost budget consists of labor costs consisting of wages for cleaning the land, wages for making planting holes, wages for fertilizing and wages for spraying plants. While the cost of plants consists of the cost of purchasing plant seeds, the cost of fertilization consists of urea fertilizer, NPK, the purchase of plant enforcers so as not to shake, as well as the cost of water for watering during the dry season because the location of the planting area in the Kamoning watershed is an area prone to drought. The calculation of the cost analysis of the Planting Budget per 1 hectare can be seen in Table 1.

Table 1. Planting Cost Budget Plan

RENCANA ANGGARAN BIAYA TANAMAN BUAH

KEGIATAN : PEMBANGUNAN DESA SPONS BERBASIS ECODRAINS
PEKERJAAN : PENANAMAN TANAMAN (BERBUAH STANDART)
LOKASI : DESA GUNUNG ELEH KEC. KEDUNGDUNG
PENANAMA PER HEKTAR : 10000 M2 (1 HA)
TINGGI TANAMAN : 1,5-2 m
JARAK TANAM : 5 X 5 M2
TAHUN ANGGARAN : 2020

NO	JENIS PEKERJAAN	VOLME		HARGA (Rp.)	
				SATUAN	JUMLAH
A	*Biaya Tenaga Kerja*				
1	Pembersihan lahan	1,00	ha	1.300.000,00	1.300.000,00
2	upah Pembuatan Lubang tanaman (0,6*0,6*0,6)	400,00	lbg	2.000,00	800.000,00
3	Upah Pemupukan pra tanam & tanam bibit	400,00	btg	2.000,00	800.000,00
4	Upah Penyemprotan Pra tanam	2,00	ltr	100.000,00	200.000,00
				Jumlah (A)	**3.100.000,00**
	Penanaman per hektar (100 m x100 m) Jarak tanam 5 x 5 m2				
B	*Biaya Bahan Tanam*				
1	Bibit Tanaman Berbuah (lengkeng/Rambutan/nangka)	400,00	btg	38.000,00	15.200.000,00
2	Pembelian bambu Ajir	400,00	btg	1.000,00	400.000,00
3	Pupuk kandang tahun 1 s/d tahun ke 2	200,00	kg	2.000,00	400.000,00
4	Pupuk Urea tahun ke 1 s/d tahun 2	100,00	kg	3.000,00	300.000,00
5	Pupuk NPK tahun 2 s/d tahun 3	100,00	kg	3.000,00	300.000,00
6	Penyiraman Musim kemarau (2 kali x truk tangki)	2,00	tangki	150.000,00	300.000,00
				Jumlah B	**16.900.000,00**
	JUMLAH TOTAL				**20.000.000,00**
	DIBULATKAN				**20.000.000,00**

TERBILANG : Dua puluh Juta rupiah

Source: processed by researchers, 2023

Based on the analysis of the budget plan in Table 1 as the table above and the unit price of work obtained the need for fruiting plants per hectare is Rp. 20,000,000.00. (Twenty million rupiah), the price of fruiting plants such as Litchi fruit, rambutan fruit, jackfruit, Sawo with prices ranging from Rp. 30-50 thousand per stem, this budget can be implemented per village, by looking at the needs of the vegetation area in the village. However, for the needs of 1 Kamoning watershed consisting of 51 villages, which is

10,144.03 ha x Rp. 20,000,000.00 = Rp. 202,880,000,000 (202.88 billion), this figure is quite large if implemented in one budget year for Sampang Regency, so the implementation strategy is to be implemented per village and the implementation year can be made in stages.

3.1.2. Infiltration Well Construction Cost

The cost requirement for the construction of one infiltration well unit is Rp.4 million per well for the type of well depth of 6 m, well diameter D 1.5 m. This estimated calculation assumes that, some houses are required to install gutters on the side under the roof and PVC pipes channeling rainwater to the well. so that rainwater enters the U-shaped gutter and then enters the 3 "PVC channeling pipe before entering the well, the system is made without any soil drainage or channels above ground level, because water from infiltration wells is expected to be clean water that enters (rainwater) without contamination with sediment from the soil or mixing with dirty water sanitation from the bathroom or kitchen.

The total number of houses / buildings in the Kamoning watershed is 68,522 buildings and houses with details of 67,720 consisting of residential houses and 792 school buildings, madrasas, mosques, and shops.so that the total budget needed for infiltration wells is the unit price of one well multiplied by the number of buildings throughout the Kamoning watershed in Sampang Regency. Where based on the calculation of the Budget Plan (RAB) RAB 1 infiltration well with a depth of H = 8 m is Rp. 4,750,000,000 (can be seen in table 4.15). for a total number of 68,522 residential buildings and other buildings including mosques, school buildings and shops.

It is known that the unit price of 1 well is then multiplied by the amount of Rp. 4,750,000.00 x 68,522 = Rp. 325,479,500,000 (325.48 billion).

Table 2. Budget Plan for Infiltration Wells

RENCANA ANGGARAN BIAYA SUMUR RESAPAN

KEGIATAN : PEMBANGUNAN DESA SPONS BERBASIS ECODRAINS
PEKERJAAN : PEMBANGUNAN SUMUR RESAPAN
LOKASI : DESA GUNUNG ELEH KEC.KDUNGDUNG

KEDALAMAN SUMUR H = : 8 m
DIAMETER SUMUR D = : 1,5 M
TAHUN ANGGARAN : 2023

NO	JENIS PEKERJAAN	VOLME		HARGA (Rp.)	
				SATUAN	JUMLAH
A	*PEKERJAAN PERSIAPAN*				
1	Pek. Pembersihan Lokasi	1,00	ls	125.000,00	125.000,00
2	Pek. Lansiran bahan dan material	1,00	ls	225.000,00	225.000,00
3	pembuangan sisa bongkaran	1,00	ls	175.000,00	175.000,00
				Jumlah (A)	**525.000,00**
B	***PEKERJAAN SUMUR RESAPAN & ISTALASI AIR***				
	Jarak tembok ke sumur maksimal 2 m				
1	Pek. Galian Tanah Sumur	9,42	m3	72.000,00	678.240,00
2	Pasang Batu pecah/Kerikil h=30 cm	0,35	m3	225.000,00	79.481,25
3	Pasang buis beton Diameter 1,5 h=50 cm	16,00	unit	125.000,00	2.000.000,00
4	cover buis beton D1,5-t=10-12 cm	1,00	Unit	110.000,00	110.000,00
5	Pekerjaan pasang Talang hujan U pvc L= 4 m	7,50	ljr	115.000,00	862.500,00
6	Pekerjaan Pipa PVC Diameter 3" (dari talang ke sumur)	3,00	ljr	134.550,00	403.650,00
7	Siku knee PVC Diameter 3"	4,00	bh	23.000,00	92.000,00
				Jumlah B	**4.225.871,25**
	JUMLAH TOTAL				**4.750.871,25**
	DIBULATKAN 1 UNIT SUMUR RESAPAN H=8 M				**4.750.000,00**

Source: processed by researchers, 2023

3.1.3. Injection Well Construction Cost

The injection well construction material is made by fitting red brick kosongan partially given a cement mixture, at the top there are 4 water catches (inlets) from PVC pipes or rice field water intake channels with avour filters, the condition of the well is a cover / opening tub that serves to open to check the depth of water as well as for the need to water the plants. The following is the calculation of the cost of 1 injection well per one well for a catchment area of 0.16 ha (40 m x 40 m), the depth of this injection well is the result of the calculation used well depth h = 9 meters with the diameter of the injection well determined as wide as = 2m, the following analysis of the calculation of the cost budget can be seen through table 3 below.

Table 3. Budget Plan for the Construction of Injection Wells in Sponge Village

RENCANA ANGGARAN BIAYA

KEGIATAN : PEMBANGUNAN DESA SPONS BERBASIS ECODRAINS
PEKERJAAN : PEMBANGUNAN SUMUR INJEKSI
LOKASI : DESA GUNUNG ELEH KECAMATAN KEDUNGDUNG

KEDALAMAN SUMUR H = : 9 m
DIAMETER SUMUR D = : 2 M
TAHUN ANGGARAN : 2023

NO	JENIS PEKERJAAN	VOLME		HARGA (Rp.)	
				SATUAN	JUMLAH
A	*PEKERJAAN PERSIAPAN*				
1	Pek. Pembersihan Lokasi	1,00	ls	150.000,00	150.000,00
2	Pek. Lansiran bahan dan material	1,00	ls	225.000,00	225.000,00
3	Perataan kembali	1,00	ls	125.000,00	125.000,00
				Jumlah (A)	**500.000,00**
B	*PEKERJAAN SUMUR RESAPAN & ISTALASI AIR*				
1	Pek. Galian Tanah Sumur	14,13	m3	72.000,00	1.017.360,00
2	Pasang Batu pecah/Kerikil h=30 cm	0,47	m3	225.000,00	105.975,00
3	Bata Merah kosongan (1 bata)	7.460,64	Bh	900,00	6.714.576,00
4	cover tutup sumur Buis beton D1,8-t=12 cm	1,00	Unit	100.000,00	100.000,00
6	Pekerjaan Pipa PVC Diameter 3"	4,00	ljr	146.250,00	585.000,00
7	Pasang Avour pemasukan air D3"	8,00	bh	11.500,00	92.000,00
8	Bak kontrol 30 x30X30 tangkapan air sawah	4,00	unit	40.165,89	160.663,54
				Jumlah B	**8.775.574,54**
	JUMLAH TOTAL				**9.275.574,54**
	DIBULATKAN 1 SUMUR INJEKSI				**9.270.000,00**

Source: Processed by Researchers, 2023

Based on the calculation of the cost budget plan in Table 3, it is found that one injection well costs Rp. 9,270,000.00 (9.27 million), from the analysis of the calculation of the needs of wells in rice fields, it is found that one well can serve 4 plots of rice fields measuring 20 x 20 meters or 2 plots of rice fields 40m x 40 m or an area of 0.16 ha per one well. The area of rice fields in the Kamoning watershed = 6,718.11 ha is known so that 6,718.11/0.16 ha the number of wells needed = 41,988 units. If it is calculated that all rice fields in the Kamoning watershed are installed injection wells. Then the cost in 1 watershed = Rp.9,270,000 x 41,988 units = Rp. 389,228,760,000.00 (Three hundred eighty nine billion two hundred twenty eight million seven hundred sixty thousand rupiah).

3.1.4. Sponge Village Development Budget Requirement

The sponge village development plan consists of several ecodrainage activities where in this study it consists of 3 ecodrainage activities, including planting plants (Vegetation) either reforestation or greening, construction of infiltration wells and construction of injection wells. Infiltration wells and injection wells have several types, the type depends on the depth of the well, where the deeper the well, the more expensive the budget per unit. The depth of the well is related to the volume of discharge it can accommodate related to its flood reduction capability, the following is the Spons Village flood control budget in 1 kamoning watershed as follows:

Sponge Village cost = Vegetation cost + Infiltration well cost + Injection well cost

Sponge Village Cost = Rp. 202,880,000,000 + Rp. 325,479,500,000 + Rp. 389,228,760,000.00

= Rp. 917,588,260,000,-

The following table shows the price per unit of infiltration wells and injection wells, and the price of the needs of one Kamoning watershed that has been calculated based on the SNI method obtained between the material price or wage price multiplied by the unit price of the SNI or HSPK obtained as shown in the following table.

Table 4. Cost per unit of Infiltration & Injection Wells and per 1 Ha of crops (1 watershed)

no	JENIS RESAPAN	TIPE	HARGA (Rp)/Unit	VOLUME 1 DAS	ANGGARAN (Rp)
1	Sumur Resapan1 h= 6 m	Qsr1	4.000.000	68.522	274.088.000.000
2	**Sumur Resapan2 h= 8 m**	**Qsr2**	**4.750.000**	**68.522**	**325.479.500.000**
3	Sumur Resapan3 h= 9,5 m	Qsr3	5.300.000	68.522	363.166.600.000
4	Sumur Resapan4 h= 12 m	Qsr4	6.230.000	68.522	426.892.060.000
5	Sumur Resapan5 = 15 m	Qsr5	7.300.000	68.522	500.210.600.000
6	Sumur injeksi1 h= 5,5 m	Qsi1	6.230.000	41.988	261.585.240.000
7	Sumur injeksi2 = 7 m	Qsi2	7.540.000	41.988	316.589.520.000
8	**Sumur injeksi3= 9 m**	**Qsi3**	**9.270.000**	**41.988**	**389.228.760.000**
9	Sumur injeksi4= 11 m	Qsi4	11.050.000	41.988	463.967.400.000
10	Sumur injeksi5 h= 14 m	Qsi5	13.650.000	41.988	573.136.200.000
11	**Penanaman Vegetasi 1ha**	**Qrv3**	**20.000.000**	**10.144**	**202.880.000.000**
Biaya Model Desa spons (1 DAS kamoning) Qms= Qsr2+Qsi+ Qrv3 =					**917.588.260.000**

From Table 4 above, it can be explained that each type of infiltration well (Qsr) or type of injection well (QSi) does not have the same price per unit depending on the depth of the well. In 1 Kamoning watershed, 68,522 infiltration wells and 41,988 injection wells are required and 10,144 ha of agricultural land for crop planting. The selection of several alternative combinations of sponge models is selected or determined on the basis of the smallest reduction value. In modeling or in the simulation of alternative combinations used or used, the following is the sponge model budget and the % flood reduction value of each combination model.

Table 5. Sponge Village Model Budget with alternative Combinations

no	Tipe Model Desa Spons	jenis banjir	alternatif Kombinasi Ecodrains		Anggaran (Rp)	% reduksi	Tipe dipilih
1	Model Spons 1 (Qms1)	Q2th	a	**Q2rv3 (reduksi Vegetasi3)**	**202.880.000.000**	**16,52**	**Reduksi terkecil**
				(Tanaman Vegetasi)			
2	Model Spons 2 (Qms2)	Q5th	a	**Q5rv3 + QSI1**	**464.465.240.000**	**48,4**	**Reduksi terkecil**
			b	Q5rv3 + QSR1	476.968.000.000	58,6	
3	Model Spons 3 (Qms3)	Q10th	a	**Q10rv3+ QSR2**	**528.359.500.000**	**57,54**	**Reduksi terkecil**
			b	Q10rv3+ QSR3	566.046.600.000	67,27	
			c	Q10rv3+ QSR4	629.772.060.000	84,1	
			d	Q10rv3+ QSI4	666.847.400.000	67,6	
			e	Q10rv3+ QSI1+QSR1	738.553.240.000	71,93	
4	Model Spons 4 (Qms4)	Q25th	a	**Q25rV3+ Qsr2+QSI3**	**917.588.260.000**	**73,14**	**Reduksi terkecil**
			b	Q25rV3+ Qsr1+QSI4	903.860.060.000	74,46	
			c	Q25rV3+ Qsr3+QSI2	882.636.120.000	74,6	
			d	Q25rV3+ Qsr2+QSI4	816.120.820.000	82,13	
			e	Q25rV3+ Qsr2+QSI3	917.588.260.000	80,06	

From table 5 above, it can be seen that the higher the type of flood (Qth return period) to be overcome, the higher the budget.

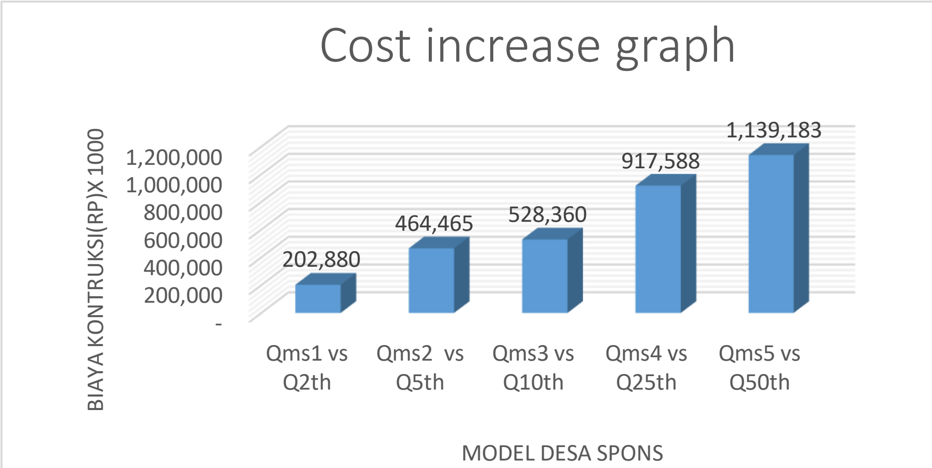

Figure 1. Graph of Increase in Sponge Village Development Budget

If you look at the budget of the sponge village model type sponge model 4 (Qms4) in table 5, it can be noted that the budget requirements for the sponge village model in overcoming the Q25th discharge with a combination of Q25rv3 +Qsr2+Qsi3. it costs Rp. 917,588,260,000.00 (Nine hundred seventeen billion five hundred eighty-eight million two hundred sixty thousand rupiah).

From the calculation of the flood discharge reduction analysis, the maximum reduction value of the sponge model is obtained with a reduction value of up to 73.14%, where the peak discharge value Q25th = 446.1 m3 / s can be reduced (reduced) to Q = 119.4 m3 / s, which is a reduction in flood discharge value of 326.3 m3 / s (73.14%) So it is very effective in reducing flooding with a budget cost of Rp. 917,588,260,000.00 (Nine hundred seventeen billion five hundred eighty-eight million two hundred and sixty thousand rupiah).

4. CONCLUSION AND SUGGESTIONS

4.1 Conclusion

The conclusion of the research entitled cost analysis on flood control of the Ecodrainage-Based Sponge Village Development Model to Overcome Flooding is the answer to the three problem formulations or research objectives, besides that it also answers the hypothesis (temporary conjecture) whether it is proven to be true or not proven in this study as for the results of the conclusions produced are explained as follows:

1. The flood reduction value of the ecodrains-based sponge village model flood control is 326.3 m3/s or 73.14% for the design discharge Q25th = 446.1 m3/s. The reduction value can make the river conditions safe from flooding because it can reduce (reduce flooding) until the discharge is below the river capacity Qms = 119.8 m3 / s < Qks =136.5 m3 / s.

2. The budget requirement for the sponge village model in overcoming the Q25th discharge requires a cost of Rp. 917,588,260,000.00 (Nine billion seventeen million five hundred eighty-eight million two hundred sixty thousand rupiah).

4.2 Suggestions

1. It is recommended that research on the sponge village model can use a combination of other ecodrainage construction such as biopores, and construction of storage ponds / bozems.
2. It is suggested that the type of vegetation plants can use other types of fruiting plants that are suitable and can live in the region besides longan or mango plants. Or other types of perennial plants even though they do not bear fruit
3. Further research is needed regarding the calculation of the cost budget for controlling the sponge village model using the NPV, IRR or BCR budget method or the Earned value method.
4. It is recommended to analyze the time of implementation of activities and management of the implementation of activities.

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