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sedimentation rate (turn).pdf

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Asian Jr. of Microbiol. Biotech. Env. Sc. Vol. 18, No. (1) : 2016 : 61-66
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ISSN-0972-3005

SEDIMENTATION RATE AND THE EFFECT TOWARD CAPACITY ON BILI-BILI RESERVOIR, INDONESIA

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(Received 7 September, 2015; accepted 17 Novemebr, 2015)

Key word : *Sediment, Reservoircapacities.*

Abstract– A decrease in the capacity of a reservoir due to sediment entering the reservoir exceeds the allowed rate. Therefore it is very necessary research that can provide information on the balance of sediment inflow into the reservoir and the sediment is allowed that can be used as a reference in maintaining the capacity of the reservoir sustainable capacity. Sedimentation rate control performed in Bili-Bili dam due to the avalanche of material Mount Bawakaraeng upstream reservoirs Jeneberang in order to function optimally. This study was conducted to obtain data on sedimentation rate, and the rate of sediment entering the reservoir capacity to know how long the sediment flow is not caused debris flow downstream reservoirs. The results showed that the changes in the surface of reservoir sedimentation results from 1997 through 2014 with a capacity of 75 million m^3 volume into reservoirs distributed unevenly. The volume of sediment into the reservoir more concentrated predominantly in the upper area of the reservoir. Nevertheless dead storage area (capacity of the dead) near the dam still be controlled even if the sediment that reaches the area is only about 20%. Then, the volume of reservoir sedimentation is based on high-elevation surface shows that the majority (75.7%) sedimentation occurred at an elevation of 65 to 99.5 m in the amount of 56.835 million m^3. Then at 15.069 million m^3 (20.1%), which reached the dead bin reservoir at an elevation below 65 m. Dead storage capacity of the reservoir has been filled more than 50%.

INTRODUCTION

The main cause of the reduction in storage capacity of dams in Indonesia is the high rate of sedimentation (Azdan *et al.*, 2008). According to the Center for Research and Development of Water Resources (2008) also mentioned several reservoirs are experiencing high sedimentation rate is Sengguruh and Karangkates watershed Kalibrantas Hulu, The reservoir watershed Solo, Reservoir Mrica watershed Serayu, Saguling and Cirata in Citarum Central and Bili-Bili Reservoir Watershed Jeneberang South Sulawesi.

Bili-Bili reservoirs also have experienced land erosion rate of 4.25 tonnes/ha/year. Classification of very severe erosion hazard level occurs on dry land amounted to 33.32 tonnes/ha/year. Zubair (2001) simulated the estimation of sediment in the watershed Jeneberang based tendencies that exist today. Sediment in 2001 amounted to 2000 m3 / km2 / year and increased by 24.2% to 2608 m^3/km^2/year in 2005, and amounted to 122.8%, or 4678 m^3/km^2/year in 2010, higher than the rate of Allowable (1500 m^3/km^2/year) into the Dead Storage Capacity (DSC) Bili-Bili dam. Environmental Research Center, University of Hasanuddin (2000) mentions that the results of measurements of sediment transport in the river channel Jeneberang ever done over a span of 15 years, ie from 1986 to 2001 showed an increasing trend of sediment by an average of 40 tonnes/ha/year with an average rate of 2.67% per year. From the results of research conducted Fadiah (2006) turns on the Catchment Rain (DTH)

Increased sedimentation occurred in 2005 with the entry of sediment derived from G. Bawakaraeng avalanche caldera wall is equal to 22,686,654 m^3 (Bapro NRM, 2005). Zubair (2001) stated that the source of sediment in reservoirs Bili-Bili derived from soil erosion (71.22%), erosion as a result of landslides and erosion of river banks (28.78%). Potential sediment due to avalanches large enough flows downstream when high rain intensity so

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prone to debris flows with high concentrations. River conditions Jeneberang are still continuous stream sediment during floods and sediment along the river flow to the reservoir Bili-Bili led to increased sedimentation in reservoirs Bili-Bili causing silting of the reservoir, which in turn will reduce the operating life of the dam and threaten the sustainability of the reservoir function. It also becomes important to be studied considering these reservoirs have a very important role in the context of socio-economic development of society, especially for the city of Makassar and Gowa Regency.

The purpose of this study was to analyze the rate of sedimentation of rivers and reservoirs upstream JeneberangBili-Bili due to avalanche caldera and analyze the rate of sedimentation and reservoir capacities of Bili-Bili

RESEARCH METHOD

Research Location

The location of this research is physically located in the DAS system Jeneberang. In this study the limits used are physical limitations have a direct impact on the carrying capacity of the reservoir Bili-Bili, the basin Jeneberang. Administratively the study area Bili-Bili dam is located in Gowa, South Sulawesi Province.

Stages of Research

Research focused on field data collection activities that aim to analyze the sedimentation rate Jeneberangriver upstream and reservoir sedimentation rate Bili-Bili.

a. Types and sources of data

The type of data used to analyze avalanches and rate of sedimentation in reservoirs Bili-Bili consist of primary data and secondary data. Primary data collected is the elevation of sedimentation along rivers and reservoirs Jeneberang Bili-Bili obtained based on measurements echosounding in reservoirs, and secondary data from the watershed and reservoir characteristics of Bili-Bili based on the results of the field survey. The secondary data collected is the data infrastructure Bili-Bili dam of NRM Hall and Public Works, climate and weather conditions of the Meteorology and Geophysics Agency.

b. Method of collecting data

Methods of data collection is done by the field survey to obtain primary data needed to conduct observations of sediment at some point observations representative. Measurement activities directed to take primary data such as elevation of sedimentation in water bodies and reservoirs. Collection of secondary data, conducted at various institutions related to the management of reservoirs and studying literature.

c. Data analysis

Calculation of the volume of sediment due to the avalanche caldera done some analysis: descriptive description via digital contour maps and secondary data to determine the state of the characteristics of the reservoir catchment area. furthermore, an analysis along the river upstream reservoirs Jeneberang and Bili-Bili and sedimentation control capacity analysis using building Sabo Dam

RESULTS AND DISCUSSION

The rate of sedimentation in reservoirs Bili-Bili analyzed using measurement data echosounding taken by 22 line cross section (L1-L22) along the reservoir area Bili-Bili. For each transverse depth data taken by boat and echosounding tool. Data collected for each transverse lines on average 50-100 times depending on the mileage and condition of the location. At each point is also made plotting the coordinates to determine the location and position of the point of data collection.

Volume of reservoir sedimentation that every year as measured by the data echosounding further analyzed based on cross-sectional area for each point of the cross section. Volume is calculated based on cross-sectional area to the distance between each point of the cross section. Volume for each year is calculated based on the last elevation data.

Based on the results of data analysis for each cross-section shows that the rate of reservoir sedimentation in 2014 had reached a total of 75,055,327 m^3. If seen changes in sedimentation rate before the avalanche caldera which amounted to 8,376,013 m^3 (1997-2001) and 14,558,105 m^3 (2001-2004) until 2014, shows that the increase is quite high, especially in 2004-2005, namely amounted to 21,743,403 m^3. More details are presented in Table 1.

Based on data from 1997 to 2014 showed an increase in sedimentation in reservoirs Bili-Bili. Increased sedimentation was mainly in 2005 has reached elevation above 60 m (at a distance of less

Table 1. Volume Sedimentation per cross-section of the Year 1997-2014

Cross-section	Volume Sedimentation (m^3)							
	1997 - 2001	2001 - 2004	2004 - 2005	2005 - 2006	2006 - 2007	2007 - 2008	2013 - 2014	1997 - 2014
L1 - L2	409.856	763.793	1.891.909	-293.390	258.556	261.401	386.616	3.417.340
L2 - L3	713.636	792.669	1.533.420	341.081	-277.302	319.661	311.805	3.415.309
L3 - L4	368.501	939.762	1.213.782	606.729	-468.159	285.148	458.805	3.119.420
L4 - L5	-83.064	1.155.873	-103.206	344.451	-297.905	203.527	567.300	1.583.448
L5 - L6	510.017	1.213.466	-187.245	225.511	302.773	832.048	780.298	2.844.820
L6 - L7	1.222.885	724.021	146.792	444.095	90.293	439.258	916.748	3.544.834
L7 - L8	410.489	33.860	2.426	294.374	146.836	-98.698	893.100	1.781.086
L8 - L9	-140.736	38.679	770.972	-1.180.029	1.012.080	253.517	2.296.148	2.797.114
L9 - L10	-588.242	91.733	1.525.169	-926.715	887.616	447.761	1.370.925	2.360.486
L10 - L11	-338.013	225.388	2.546.338	-918.752	1.299.883	943.648	819.973	3.634.817
L11 - L12	1.773.260	672.264	2.812.859	-824.250	625.277	1.323.508	626.262	5.685.673
L12 - L13	2.302.718	1.789.475	954.262	1.451.066	-177.507	1.166.898	511.840	6.831.854
L13 - L14	1.308.677	1.817.775	314.865	2.091.326	-870.950	410.868	265.050	4.926.742
L14 - L15	465.101	1.200.576	1.483.342	999.684	-545.585	-242.826	13.870	3.616.988
L15 - L16	-85.844	1.463.717	2.010.121	612.978	567.781	-307.047	137.009	4.705.762
L16 - L17	24.119	520.796	2.305.184	776.520	62.289	356.925	757.904	4.446.812
L17 - L18	321.434	-187.524	2.166.379	589.703	-388.331	852.853	938.192	3.439.853
L18 - 19	106.759	296.976	859.526	481.675	-207.272	634.998	562.324	2.099.988
L19 - 20	-325.541	1.004.805	-439.201	1.435.896	-792.915	416.070	1.205.163	2.088.207
L20 - 21	0	0	-63.966	22.526	-16.769	0	193.609	135.400
L21 - L22	0	0	-326	-2.991	0	0	83.173	79.856
Total	8.376.013	14.558.105	21.743.403	6.571.487	1.210.690	8.499.518	14.096.113	75.055.327

than 1 km from the dam). When compared to 2004 which is still in elevation of 50 m. This show has been an increased sedimentation of about 10 m in just over 1 year. Events avalanche caldera in 2004 is the cause of increased sedimentation, but then the rate of sedimentation in reservoirs Bili-Bili can be controlled by reducing the percentage increase in sedimentation for 2006 through 2014.

Overall results of reservoir sedimentation volume measurement is obtained that the sedimentation rate before the landslide caldera, which is accommodated in the reservoir sedimentation Bili-Bili cumulatively amounted to 8.376 million m^3 (April, 2001). After the landslide is the sediment volume in 2014 reached 75.055 million m^3. Accumulation of reservoir sedimentation rate is highest when the avalanche caldera after the incident in 2004, but then can be controlled in the next year until 2014.

Volume sedimentation into reservoirs Bili-Bili distributed based on the elevation of the base of the reservoir. Based on the technical data Bili-Bili dam building shows that, for the elevation of 101.6 to 99.5 m is the capacity of the reservoir to function as flood control and to limit the supply of raw water elevation is at 99.5 to 65 m. As for capacity Capacity Dead (dead storage) at an elevation of 65 m with a maximum of reservoirs is 29 million m^3.

Volume of reservoir sedimentation when analyzed by high-elevation surface shows that the majority of sedimentation occurred at an elevation of 65 to 99.5 m in the amount of 56.835 million m^3 or 75.7% of the total sediment into the reservoir. Then at 15.069 million m^3 (20.1%), which reached the dead bin reservoir is at an elevation below 65 m. however, if it is seen specifically in dead storage reservoirs, it means that the dead storage capacity has been filled more than 50%. More details can be seen in Table 2.

Based elevation data (echosounding) for each point of the cross section (L1-L22) are taken along the reservoir area Bili-Bili and data point coordinates of each point of observation, analysis 3D using statistical software Surfer 8 to get a visualization of surface changes. The results of reservoir sedimentation from 1997 to 2014. The analysis showed that in 1997 the surface sedimentary deposit at a depth of less than 65 m (capacity of the dead) is still in a state of normal (Figure 1). However, the differences are very significant visible if seeing the results of the plot to 2014 which saw the sediment surface is getting higher sedimentation (red color changes

Table 2. Percentage of total sedimentation of the reservoir capacity

Reservoir capacity (1000m^3)		Elevation (m)	Sedimentation (1000 m^3)	Total (1000 m^3)	%
Flood Control	41.000	100 - 101.6	1.697	3.151	4,2
		99.5 - 100	1.454		
Raw Water	305.000	90 - 99.5	11.602	56.835	75,7
		80 - 90	26.501		
		70 - 80	15.183		
		65 - 70	3.549		
Capacity Dead	29.000	60 - 65	8.279	15.069	20,1
		50 - 60	6.395		
		40 - 50	394		
Total		375.000		75.055	100

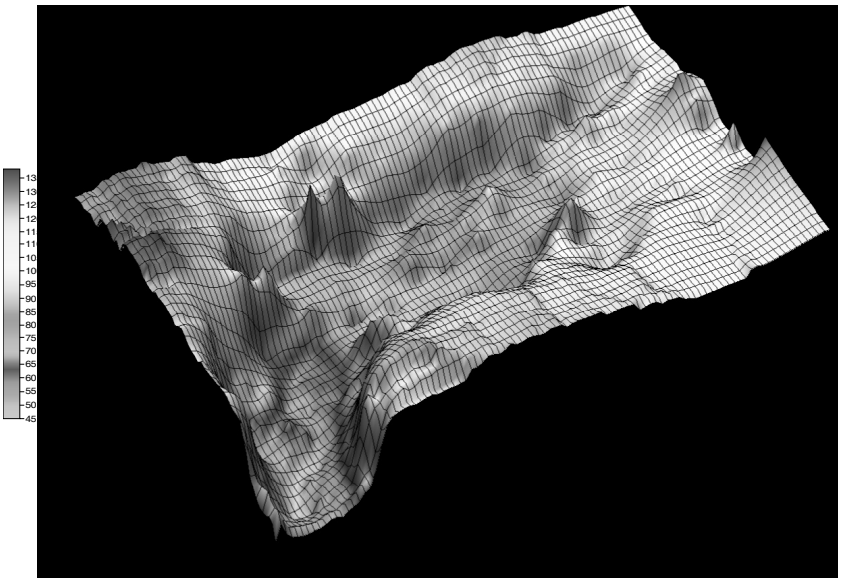

Fig. 1. Visualization of sedimentation in reservoirs Bili-Bili 1997.

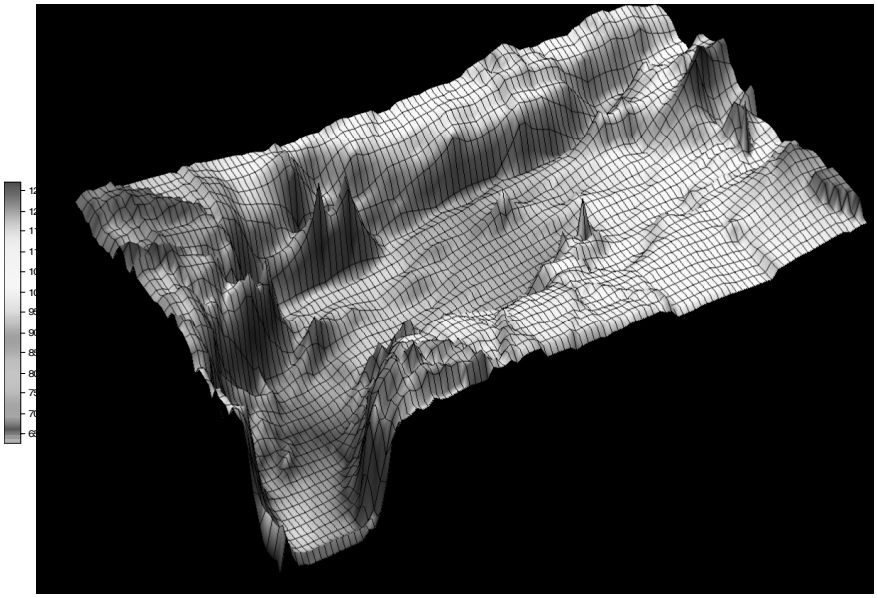

Fig. 2. Visualization of sedimentation in reservoirs Bili-Bili 2014.

increasingly dominant) reaches a maximum elevation to the capacity limit capacity to die (Figure 2). Comparison of the state of the surface change results of reservoir sedimentation that occurred in 1997 and 2014 showed increased levels of sedimentation that can significantly impair the function of the reservoir.

Further, when considering the results of the analysis of the results of reservoir sedimentation surface changes after the events avalanche caldera in 2004 which turned out to have an impact on the measurement results in 2005. The change appears to have shown a rapid improvement, especially in the area below the elevation of 65 m (capacity of the dead).

From the analysis of three-dimensional visualization also illustrates clearly that changes the surface of the reservoir sedimentation results from

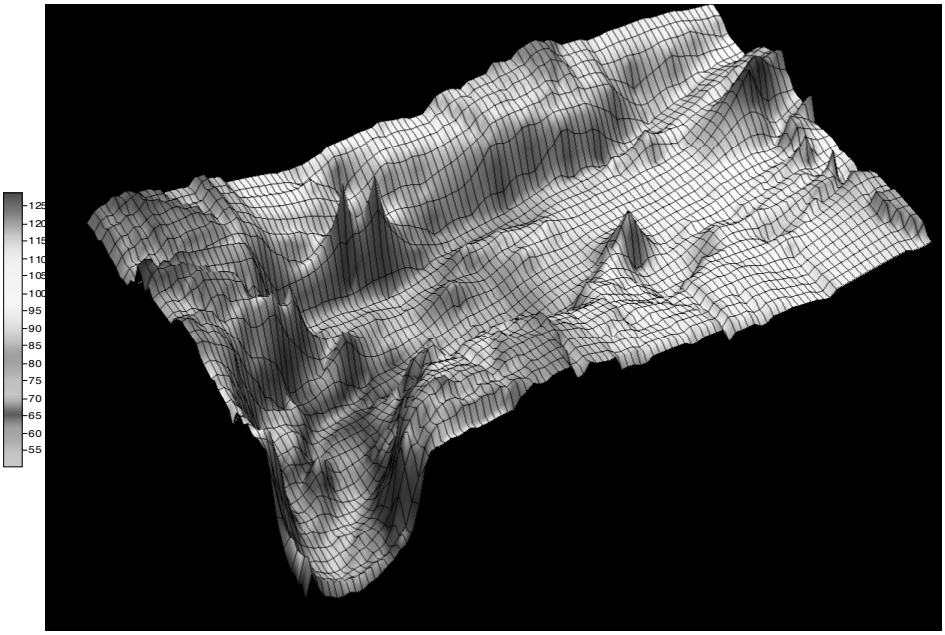

Fig. 3. Visualization of sedimentation in reservoirs Bili-Bili 2004.

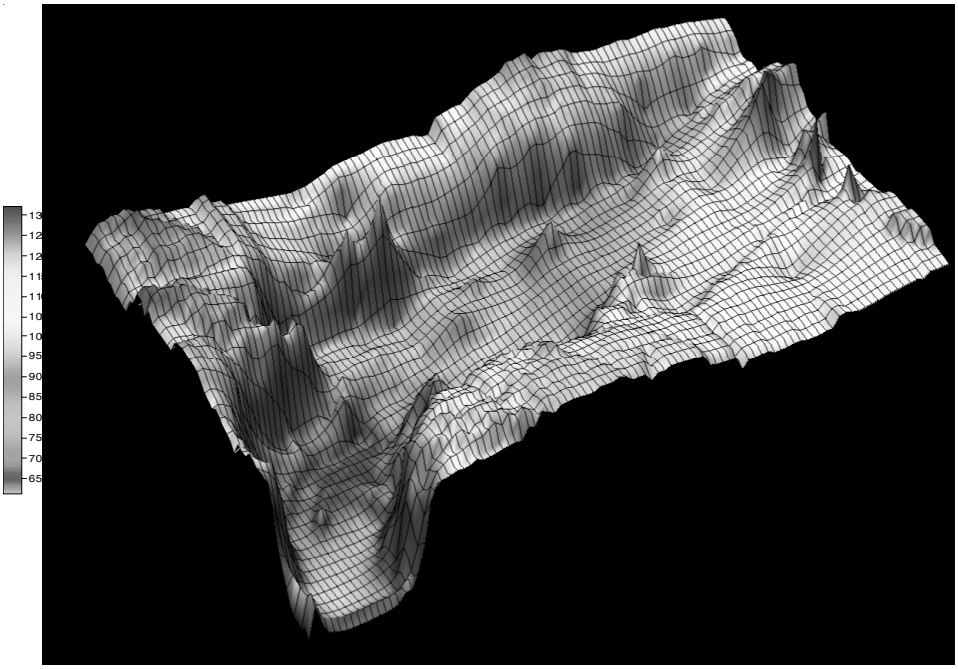

Fig. 4. Visualization of sedimentation in reservoirs Bili-Bili 2005.

1997 through 2014 with a capacity of 75 million m^3 volume into reservoirs distributed unevenly. The volume of sediment into the reservoir more concentrated predominantly in the upper area of the reservoir. Nevertheless dead storage area (capacity of the dead) near the dam still be controlled even if the sediment that reaches the area is only about 20%.

CONCLUSION

Sedimentation occurred at an elevation of 65 to 99.5 m in the amount of 56.835 million m^3. Then at 15.069 million m^3 (20.1%), which reached the dead bin reservoir at an elevation below 65 m. Dead storage capacity of the reservoir has been filled more than 50%. Furthermore, from the analysis of three-dimensional visualization of the surface it appears that the change of reservoir sedimentation results from 1997 through 2014 with a capacity of 75 million m^3 volume into reservoirs distributed unevenly. The volume of sediment into the reservoir is more concentrated predominantly in the upper area of the reservoir. Nevertheless dead storage area (capacity of the dead) near the dam still be controlled even if the sediment that reaches the area is only about 20%.

REFERENCES

Azdan, M.D. and Candra, R.S. 2008. *Kritisnya Kondisi Bendungan di Indonesia*. Di dalam Seminar Komite Nasional Indonesia untuk Bendungan Besar (KNI-BB). Surabaya. 2-3 Juli 2008.

Asrib, A.R., Purwanto, Y.J. and Erizal, 2014. *Analysis of Erosion Level Using Map Windows Agricultural Non Point Source Pollution (MWAGNPS) on Jeneberang Sub-Watershed South Sulawesi Province*.International Journal of Science and Engineering. 6(1): 1-5.

Bapro, PSDA. 2005. *Laporan Hasil Echosounding Waduk Bili-Bili*. Bagian Proyek Pengelolaan Sumber Daya Air Jeneberang. Makassar.

Fadiah, 2006. *Kajian Pengaruh Erosi Lahan terhadap Sedimentasi di Waduk Bili-Bili Kabupaten Gowa Propinsi Sulawesi Selatan*. [Tesis]. Sekolah Pascasarjana, Universitas Gadjah Mada. Yogyakarta.

PPLH UNHAS, 2000. *Pengelolaan Terpadu Daerah Aliran Sungai (DAS) Jeneberang Tahap I.* Pusat Penelitian Lingkungan Hidup. Makassar.

Zubair, H. 2001. *Model Pengendalian Sedimen untuk Mempertahankan Kapasitas Waduk*. Pusat Penelitian Lingkungan Hidup Universitas Hasanuddin. Makassar.

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