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Experimental Study on Influence of Sand Pocket Towards Sediment Distribution Pattern in Jeneberang River

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Abstract
Sand Pocket which located at Jeneberang river is one of the river structure to control sediment flow towards the dam. Bili-bili dam face a huge sedimentation problem in 2004 caused by the collaps of mount Bawakareng gigantic caldera as the upstream of Jeneberang river.which brings about 80.5 million cubic of sediment, and estimated that around 102.5 million cubic will be collaps anytime. There are 5 (five) units sand pocket in Bilibili dam system, inwhich just one unit still function, even in damage condition.
This research conducted to investigate the influence of sand pocket towards sediment distribution pattern, with 1 : 40 scale .The result shown that the flow occured not simetrical caused the sediment concentrated at the right side at the down stream of the sand pocket, and depth scouring, and the velocity of flow more higher at the right side of down stream of the sand pocket

Keywords: *Sand Pocket , Sediment, sedimentation, sediment transport*

1. Introduction

Bili-bili dam has been constructed since 1992 and impounded in 1999 .Sand pocket is one of the sediment control structure inwhich function also as the sand mining location.. in 2004 a gigantic caldera of mount Bawakaraeng as the upstream of Jeneberang river collaps and bring about 80.5 million cubic of sediment .This study conducted to investigate the capasity of the sand pocket.and the sediment distribution pattern.
The prototype is sand pocket no. 3 which has 336 meter length, 7 meter height and the storage capacity is 129, 000 m^3.

Fig. 1. The Physical Model Processing

Figure 1. Shown the processing of physical model done in Laboratory with 1 : 40 scale.

2. Methodology

The scale of the model done by applying the theory of hydraulic model, froude criteia, dynamic motion criteria, roughness criteria, tractive force criteria, critical tractive and sediment load transport criteia. The experimental study doing by the physical model using undisturbed model, ofwhich the upstream of the sand pocket constructed with fixed bed model, and at the downstream constructed with moveable bed model.

3. Result and Discussion

The experimental study doing by using data of sediment in year 2004 – 2012, with the flood discharge : :Q = 720 m^3/s, 1440 m^3/s, 1900 m^3/s and 2400 m^3/s,

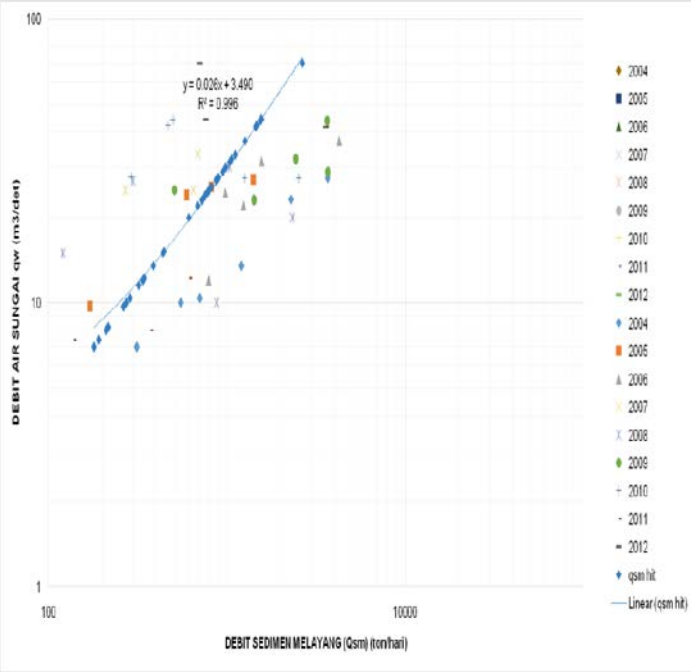

Fig. 2. Relation Between Sediment - Discharge

Figure 2 showing the relationship between suspended load sediment versus water discharge, ofwhich the result is Y = 0.026 X + 3.490, and R^2 = 0.996 using linear equation.

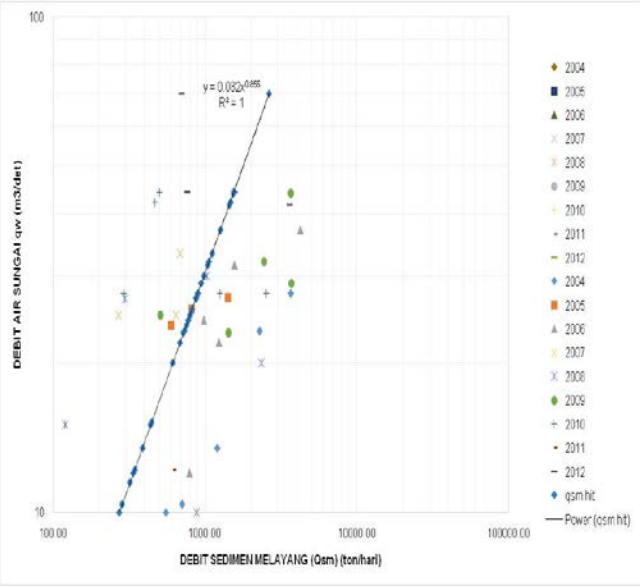

Fig. 2a. Relation Between Sediment - Discharge

Figure 2a showing the relationship between suspended load sediment versus water discharge, ofwhich the result is Y = 0.082 X $^{0.855}$, and R^2 = 1 using power equation. Based on figure 2 and figure 2a showing that the deviation by using linear regression is 0.004. And the power equation more accurately.

Based on analysis shown that the suspended load at sand pocket No. 3 is 24.17 m^3/s. And sediment volume is Vs = 1373.18$m^{3,}$ further more the sediment flowing to the sand pocket is Vs = 501,212.23 m^3, with the assumption the sand mining is about 385,000 m^3, so the sediment flowing to the sand pocket No. 3 is 116,212 m^3. It means the storage capasity of the sand pocket is safe .

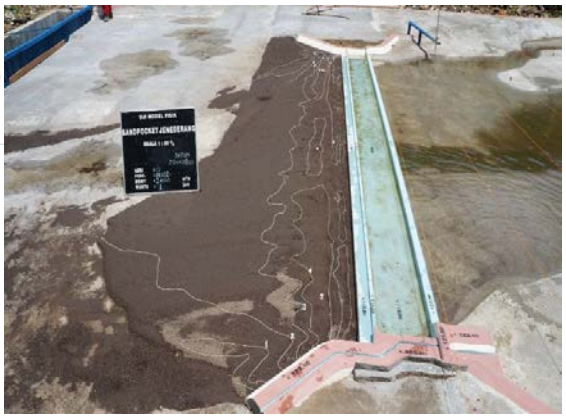

Fig.3. Sediment Distribution Pattern

Figure 3 showing the sediment distribution pattern, inwhich the sediment concentrated at the right side.

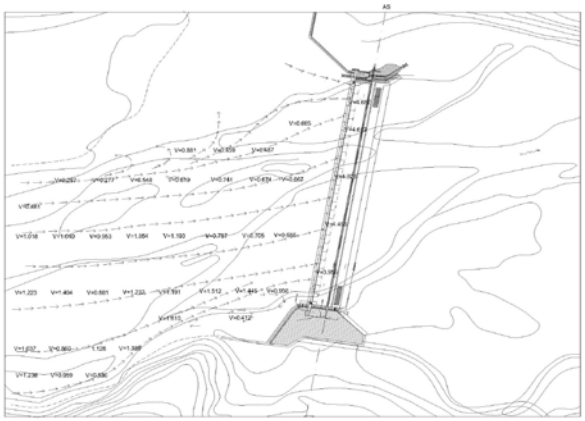

Fig. 4.Vellocity and Direction of the Flow

Figure 4 showing the flow direction has a difference pattern at the left side and at the right side . The direction of flow distributed quite evenly on each reach of the cross section, and fairly even toward the crest, but vortex occurs at the right side.

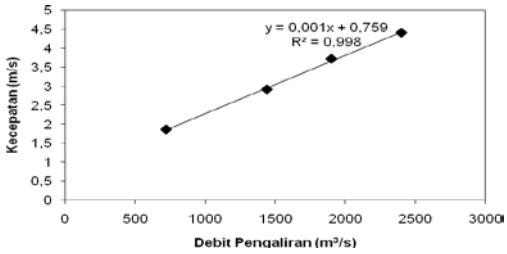

Fig. 5. Discharge and Velocity

Figure 5 showing the relationship between flow discharge and flow velocity, Y = 0.001 X + 0.759, with R^2 = 0.998 inwhich the flow velocity increase about 135% between the discharge (Q = 720 m^3/s – Q = 2400 m^3/s)

4. Conclusions

Based on the experimental study, shown that the capacity of sand pocket of Jeneberang river could accomodate the discharge and the sediment, but the hydraulic jump not occur at the stilling basin, and jumping directly to the apron at the down stream of the sand pocket

5. Reccomendation

The sand pocket must be protected with rip rap construction , and the level of the apron best be lower about 3 meters.

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