International Journal of Latest Research in Engineering and Technology (IJLRET)
ISSN: 2454-5031
www.ijlret.com || Volume 02 - Issue 08 || August 2016 || PP. 34-39

Water Management Model For Water Conservation In The Downstream Of Petanu River Based On Environment

I Gst. Agung Putu Eryani[1], Putu Suranata[1], I Wayan Jawat[1]
[1](*Civil Engineering, Warmadewa University, Denpasar, Bali, Indonesia)*

ABSTRACT: Bali has an area of 563 666 ha, consists mostly on land with a slope between 0-2% up to 15-40%. Water is a major requirement for the process of life on the earth, which means there would be no life on this earth if there is no water. Water is an environmental components that are affected by other components. Bad quality of water will cause the environment to be bad. River water flows from upstream to downstream will be discharged into the sea through the mouth of the river (Loloan). The water flowing in a river surface water caused by rain, springs, groundwater and household waste. This study will assess the potential magnitude of surface water in terms of quantity and quality of water for downstream Petanu in Gianyar, and drafting a model of water management in downstream river Petanu for water conservation based environment. This research method uses quantitative research using primary data of water quality and quantity of water in the river downstream of Petanu River compared with secondary data analysis using software RIBASIM. Calculation of length of the river basin area and the main use of Arc. GIS 10. This research obtains Petanu basin area amounted to 96.970 km^2, with a length of 46.770 km along the main river. Maximum discharge amounted to 2,819 m^3 / sec. Water quality downstream in July 2016 for the BOD was 2.16 mg / L, COD 6.4 mg / L and DO of 4.83 mg / L. Potential Petanu river water downstream of the water quality can meet the water quality standard Class I and of the quantity can be managed to support water conservation in Gianyar Bali Province.
KEYWORDS: downstream rivers, water potential, conservation

I. INTRODUCTION

Bali has an area of 563 666 ha, located at 8 ° 3'40 "- 8 ° 50'48" south latitude and 114 ° 25'53 "- 115 ° 42'40" east longitude. Most consist of land with a slope between 0-2% up to 15- 40%. The rest is a land with a slope of over 40%. On the cliffs of the river which has a steep slope (> 70%). Number of river reaches 391 DAS. Water flowing from the mainland toward a body of water is called surface runoff (surface run off), and the water flowing in the river to the sea called the flow of river water. Water is a major requirement for the process of life on the earth, which means there would be no life on this earth if there is no water. Water is an environmental components that are affected by other components.

Bad quality of water will cause the environment becomes worse and affect the health and safety of humans and other living things. River water flows from upstream to downstream will be discharged into the sea through the the river estuary (Loloan). The water flowing in a river surface water caused by rain, springs, groundwater and waste or household waste. Petanu River has a water resource that is a natural resource that is not living (abiotic) but can be renewed (renewable resources). Water is one of the most important natural resources for living beings but it is often a problem in existence, circulation and distribution.

In addition, because of its properties, water is easily contaminated by other chemical substances through environmental pollution. It is therefore necessary conservation efforts through a system of effective and efficient management. so the usefulness can occur on an ongoing basis to the future generations. Water resource management is the conservation of water resources sustainable utilization of water resources is equitable to the various needs of the community that meet the quality and quantity control of water damage, empowerment and increased role of public, private and government in the management of water resources, increased openness and availability of data and information on water resources management [1].

This research will assess the potential magnitude of surface water in terms of quantity and quality of water for at Petanu River estuary Gianyar regency. What is the magnitude of the water potential in the downstream to the mouth of the River Petanu, Gianyar in order to be able to support water conservation in the province of Bali and How the draft model of water management in downstream river Petanu based environment.

The purpose of this study is:

1. To obtain the magnitude of the water potential in downstream river Petanu Gianyar district to be able to support the conservation of water in Bali
2. To design a model of management of water resources in the river downstream Petanu based environment.

II. LITERATURE REVIEW

A. Water Conservation

Water conservation is in principle the use of rainwater that falls onto the surface of the soil as efficiently as possible with the time setting the proper flow so there is no flooding in the rainy season and there is enough water in the dry season [2]. Water conservation can be done by increasing the utilization of hydrological components such as surface water and groundwater as well as improving the efficiency of irrigation water use [3].

The advantage gained through water conservation strategies aimed to increase water reserves in the soil and around the root zone of plants on agricultural areas are: realization of flow control surface, peningakatan infiltration and reduced evaporation. There are two approaches that can be taken to streamline the use of water in the plantation areas, namely: through the choice of plants according to the climatic conditions and water conservation techniques through the use of mulch, gulud, and no-tillage techniques [4].

B. Conservation of water resources

Conservation of water resources is an effort to maintain the existence, the sustainability of the circumstances, the nature and function of water resources in order to continue to be available in sufficient quantity and quality to meet the needs of living things both at present and in future generations.

C. Water Potential

Water is essential for human life, every day people are expected to require minimal clean water as much as 100 liters per person, such as for drinking, cooking, bathing, washing and others [5].Water potential is the potential of water resources that already exist today and that meet the water needs for the foreseeable future. Potential is the average water discharge at the point of the review.

D. Management of Water Resources and Coastal Watersheds.

Sunaryo and the Walujo [1] said there are seven scope of water resources management that is:

1. Management of catchment (watershed management) are attempts to do so as a function of water catchment areas can be maintained with reforestation, terracing and land use controls.
2. Management of water quantity (water quantity management) is the water supply in a fair and transparent, where the achieve is done through the establishment of the licensing water use and allocation of water and control water distribution.
3. Water quality management (water quality management) is an effort to maintain water quality in order to remain in accordance with the conditions established quality standard.
4. Flood control (flood control management) is a flood control measures such as minimizing runoff that occurs when it rains, restrict groundwater pumping is causing subsidence of ground water.
5. Environmental management of the river (river environment management) is an effort to control the use of land in the area of riparian and aquatic biota in order to increase the function of water resources is maintained.
6. Management of water infrastructure (infrastructure management) is an attempt to do in the management of irrigation facilities and infrastructure function that is maintained in accordance with the age and the intended purpose.
7. Research and development (research and development) is to support and improve the management of water resources in a region with innovations both in the field of technology and management.

E. Water Discharge

In hydrology stated that water discharge of the river estuary is the river water level that measured by a measuring tool surface river water. The measurements were carried out every day, or else with the understanding that the discharge or flow is the flow rate of water (in the form of water volume) passing through a river cross section per unit time. In the SI unit system the amount of discharge is expressed in units of cubic meters per second (m^3 / s).

F. Water Quality

Bali Provincial Government are in the process of formulating its own water quality standards based SKAN (National Water Quality Standards) are new. SKAN newly formulated and describes 4 classes for the use of water benefits the population is as follows:

- Class I. Raw water to clean water supply (drinking) with the processing and all other uses of Class II to Class IV
- Class II. Water for recreation and all other uses of class III and class IV
- Class III. Water for freshwater fisheries for breeding and utilization of class IV
- Class IV. Water for Irrigation water

III. METHODOLOGY

The research location is in the River Estuary Petanu ended on the Saba beach, Gianyar Bali Province. Data velocity and depth of the estuary of the river water to obtain a water discharge at river estuary is obtained from measurements with current meter and water quality. Water sampling estuaries held for 1 (one) year is the dry season and the rainy season in 2016. This research intended to collect potential of the water at the estuary of the river in terms of water discharge (quantity of water) and some of the water quality in a body of water that will be researched in the field and in the laboratory, with a number of specific sample but has the same characteristics as body water. Samples were taken at three points, with the distance of each point of 300 m. Sampling was carried out around the point 1 at 14:50, point to 2 at around 15:00, and point to 3 approximately at 15:10. Water sampling using a Van Dorn water sample. First water sample to be used should be clean, rinsed with distilled water first, then with the water sample to be taken. After the closing tool to open before the water sample that sunk into the water sample by means of a water depth of 1 m and a weight was dropped right on top of the device through the rope so that the lid tightly closed. Then the water is put into bottles until it is full and closed well to avoid contact with air.

Preservation of samples intended to prevent disturbances that could alter the nature of the original state of the sample. This research used a special glass bottles with different treatments depending on the parameters in the review. For testing samples of COD and BOD use glass bottles to be filled and sealed with a glass bottle cap. There should be no bubbles, if there is a bubble of water then water sampling repeated. The analysis should be carried out on a sample depending on the type of water body being examined, the usefulness of these water bodies to local communities for drinking water supply and agriculture and the kind of pollution that could be expected to occur. Several other elements are not lost from the aqueous solution during the course of the river, solution was made carefully and should not be polluted, for example, because it is not stored properly or part of the solution has been taken.

Map of the water system in the region of Petanu River upstream and downstream as well as at the river estuary has been processed using software RIBASIM by entering the hydrological data. Map of the water system will illustrate the potential of water and water management as well as the layout of the building suitable to manage the water.

IV. RESULT AND DISCUSSION

The results of the study using Arc. GIS 10 with shapefile of watershed area on the island of Bali, using UTM coordinate system 500 S and polygon geometry calculations, and then calculated perpoligon watershed area, the obtained Petanu watershed area amounted to 96.970 km^2, with a length of 46.770 km main river. Map DAS Petanu can be seen in Figure 2. Total annual rainfall in Gianyar regency in 2014 is 2259 mm. Rainfall monthly average ranging from 11 mm to 401 mm. The highest rainfall occurs in January and lowest in August. Based on rainfall data of monthly average of 200 mm shown in Figure 3.

Monthly rainfall is input in the analysis using software RIBASIM. Retrieved potential of water in the river downstream precisely in Petanu estuaries amounted to11.2 million m^3 / year of processed and simulated to support irrigation activities by 50%, domestic water (the water needs of households) by 40% and 8% of tourism activities as well as water fish ponds in the area the river downstream of 2%.

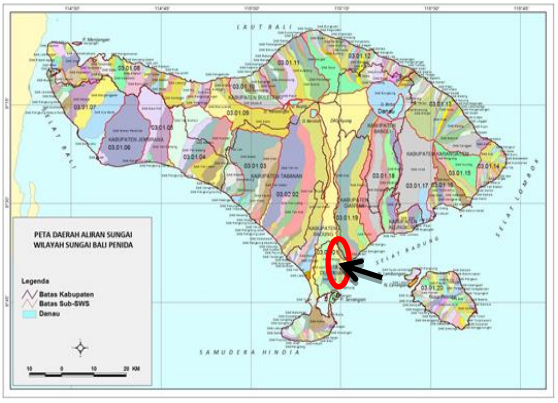

Figure 2. Map Of Petanu River Downstream Area

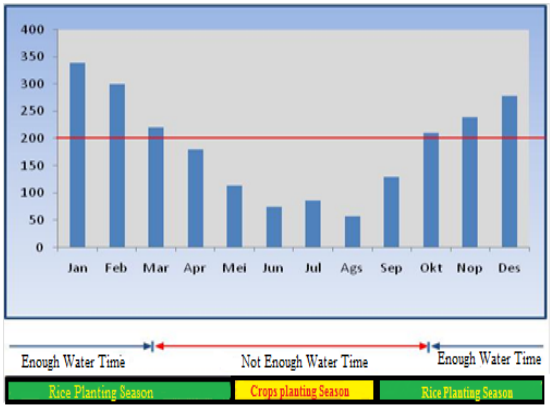

Figure 3. Monthly Average Rains In The Watershed Petanu

Results of water quality checks at the stage of monitoring showed the BOD value (downstream) of 2.16 mg / L, while the requirements for Class I water quality standard of 2 mg / L. Water quality tests for COD by COD 6.4 mg / L and a DO of 4.83 mg / L. to meet the water quality standard class I. This value reflects an increase in the downstream part of the oxygen required to decompose biodegradable organic compounds. Sampling conditions of this area is in Banjar Saba, Gianyar Kemenuh- Saba- village that the sample point downstream part in Banjar Saba, Saba village, Blah Batuh of Gianyar District. Water quality in this section fulfill not meet water quality criteria for Class I. The area downstream of the Petanu is an agricultural area (rice field) and housing. The test results of water quality in downstream river Petanu based on primary and secondary data from 2013 to 2016 for pH, temperature, BOD, DO COD and it can be seen in Fig. 4.

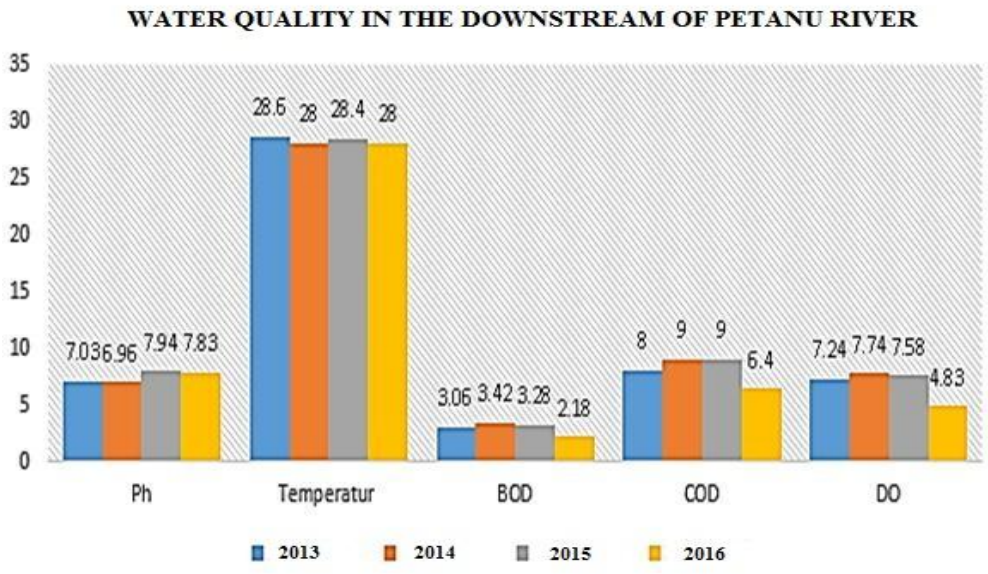

Figure 4. The Test Results Of Water Quality In The Downstream of Petanu River

Conservation of water downstream Petanu through effective management and efficient use is very necessary and urgent activities. Water management is based on the existence of the river environment as a natural resource is a part of a water conservation program that fully maintain, rehabilitate, maintain and utilize the resources available water effectively and efficiently for the welfare of society. This activity is required to reduce revolution and pollution of water resources due to overexploitation treatment in order to meet the

increasing needs of the community. Will have an impact on a potential shortage of water. Lack of water in the dry season will have an impact on land use in the area downstream. Comprehensive land use irrigation area in the watershed Petanu measuring 32.94 hectares or 1.51% of the total area of 2183.00 ha of raw rice fields.

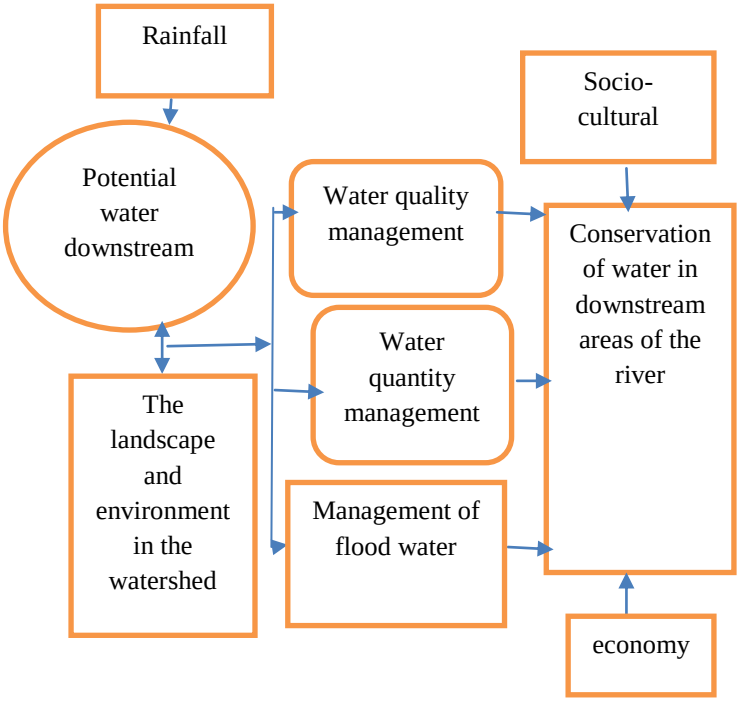

Figure 5. The draft water management model for conservation in the downstream of Petanu River

Water conservation model designed like Figure 5. To improve the entry of water into the soil through a process of infiltration and filling the pockets of water in the basin as well as reducing water loss. The advantage gained through water conservation strategies aimed to increase water reserves in the soil layer around the existing downstream in agricultural areas are: realization of flow control surface, peningakatan infiltration and reduced evaporation. There are two approaches that can be taken to streamline the use of water in the plantation areas, namely: through the choice of plants according to the climatic conditions and water conservation techniques through the use of mulch, gulud, and no-tillage techniques [4].

Water resource management is the effort to plan, implement, monitor and evaluate the implementation of water resources conservation. The pattern of water resources management is the basic framework in planning, implementing, monitoring, and evaluating the conservation of water resources, efficient use of water resources, and control of water damage in nature, especially in the downstream areas of the river. Water can only be controlled through the container catchment area (catchment area) or Watershed. Therefore, this area is able to receive incoming water no matter how, and can save it, and running it into the sea.

Water conservation efforts must be accompanied by an efficient water utilization. Not all forms of water conservation techniques can be applied to any environmental conditions. There are some limiting factors that need to be considered in the environmental determining water conservation techniques to be applied. Application errors will result not only in the ineffectiveness of a water conservation technologies, but also increase costs and decrease productivity of the land.

The limiting factors that must be considered in determining the water conservation techniques are: climate (rainfall), slope, effective soil depth and soil texture. Total rainfall determines the volume of rainwater that must be conserved which will be the basis for determining the dimensions of water conservation technology to be applied in certain areas.

Methods of water management in the downstream of Petanu River in water conservation efforts are:

a. Water resource potential in the downstream area is managed for compliance as well as the carrying capacity of the area that is suitable for irrigation, domestic water needs and travel
b. Regional environmental management business support downstream indigenous and cultural communities
c. Environmental conditions in the downstream of the river were clean and maintained, the water quality will meet the quality standards

d. Increasing the role of community participation in water management in developing businesses downstream
e. Provide supporting facilities such as reservoir water conservation, water management facilities and environmental management, adapted to the economic ability.

V. CONCLUSION AND SUGGESTION

Water conservation is the use of rainwater that falls to the ground for local agriculture / irrigation, the need for domestic water as efficiently as possible, and set the time stream to prevent flooding that damages the environment and there is enough water during the dry season, the water quality that meets quality standards. Based on the analysis can be summarized as follows:

1. The potential of the water is assumed to be used: 50% for irrigation water, domestic water (household) 40%, for industrial water (water for the hotel) 8% and 2% fish pond water, water potential Petanu River estuary in the district of Gianyar, amounting to 11.2 million m^3 / year.
2. The results of water quality testing in Petanu river estuary, BOD, do not meet water quality standards of class I. COD and DO meet the standard of first class water quality standard (raw water).

Based on the results of research and analysis of data in this research, then it needs to be recommended are:

1. The management of water potential Petanu river estuaries, in the design of the models need to add economic aspects and socio-cultural aspects.
2. Keep the socialization of public awareness to care and take responsibility for the environment, for example by:
   - do not waste water / stool in river. Because the stool is the best medium for the growth of germs from mild to severe.
   - do not throw garbage in the river. Waste dumped carelessly in the river water flow in the river will cause stunted and collected at the mouth of the river. moreover, it can trigger a flood of rainy season
3. Domestic wastewater (domestic) should be treated before it is discharged into the sewer that leads towards the river / water body with the intention of lowering the inorganic nitrogen and suspended substances.

VI. Acknowledgements

Praise and thanks be spoken to all those who have helped retrieval of data and carry out measurement and testing water mainly from the staff of Public Works, Bali Province.

REFERENCES

[1] Sunaryo, M., and Waluyo, T., 2004. Water resource management concepts and their application. Malang.
[2] Arsyad, S. 2000. Soil and Water Conservation. PPT Media Production Information. Information Resource Institution. Institut Pertanian Bogor, IPB Press, Bogor.
[3] Subagyono. 2007. Agricultural Water Conservation To Adapt To Climate Change. Anthology Soil and Water Conservation. Management
[4] Santoso.D; J. Purnomo; I.G.P Wigena; E.Tuherkih. 2004. Soil Conservation Technology vegetative. In the Soil Conservation Technology On Dry Land sloping editor: U.Kurnia et al 2004. Research and Development Center Soil and Agro-climate. Bogor.
[5] Taty, and Satmoko. 2007. Alternative water treatment technology to meet water needs in a residential area fishermen, Journal of Te Arsyad. S. 2000. Konservasi Tanah dan Air. IPB Press.