SUMMARY

Water is the most essential factor for human. The fresh water demand is increasing for years. However, water availability is more and more decreasing. The condition will continuously stimulate a conflict. Basically, fresh water on land is as the product of hydrologic cycle, such as water from the atmosphere will be going down into the earth as the rainfall and then returns back into atmosphere as evaporation. In hydrologic cycle, the most important factor in maintaining water availability on earth (like the springs, aquifer, reservoir, etc.) is the condition of water catchment areas (DTA).

The demand for space in water catchment areas (DTA) having the hydrologic function in maintaining water availability often neglected the impacts concerning the water availability. The relatively low understanding on the existence of water catchment areas (DTA) is caused by the less effort on the economical valuation of water availability. Then, it will cause less attention to the water catchment availability (DTA). In addition, the further impact is the less availability and the more difficulties in obtaining water for people. They have the rights to obtain water. Therefore, it is a violation against the rights to complicate to obtain water either consciously or not.

Rawapening Lake is the part of Tuntang Watershed (DAS) that begins to indicate the functional failure to support the water resources system in supporting life. It is due to the damage of land use on water catchment area, so the more flood and drought, the less agriculture, fishery and hydro electrical power (PLTA) production. The management of water catchment area of the lake needs long term coordination and time as well as high cost. One of the alternatives of financing in the water catchment area management is the environmental service financing taken from the users, like PLTA, the raw water supply, and irrigation. The service users accept the environmental service of water availability for generating turbine, supplying fresh water and irrigation water demand. When the environmental condition experiences degradation, the given service will also experience it, unequally distributed water availability, flood and drought.

The management effort of integrated watershed needs long coordination and time as well as high cost. According to Tampubolon (2009), the limitation of government funding for watershed management is as the dominant factor in making effort to force the degradation rate of environmental quality. The approach used in environmental management financing is recently based on polluters pay principle. It is necessary to provide charge to the environmental service users (user pay principle) since the approach is still inadequate. Therefore, multi stakeholders are responsible for the financing of environmental management. To strengthen the statement, Bambang (2000) stated that to make easy the understanding on how important an ecosystem is, one of the relatively easy key points that can be agreed on among all

scientific disciplines is by giving price to the goods and services which are produced from resources and environment.

Up to now, the implementation on financing concept of watershed management by paying the environmental services is still low if it is compared to the cost demand for preventing the faster of environmental degradation, because there has not been the mechanism and regulation that regulate the payment of environmental service. In addition, the feedback of environmental service payment is due to the business activity that has not yet been clear and measured.

To increase the implementation of environmental service payment, this study suggests that the usage of investment mechanism on environmental service payment. Investment is an economic activity that intends to obtain or maintain the benefit of asset or cost. The analysis of cost and benefit has to be clear and measured so it is able to be determined the planning on benefit and feasibility of the investment activity. In relation with the watershed management, the investment is as the conservation which intends to maintain and increase water availability for environmental service users. Modeling approach of water balance is used to find out the level of water availability.

The general model that is used for quantitative analysis of water balance is Water Balance Model. This model is developed based on the hydrologic cycle using the principle of mass conservation. The component of analysis includes water demand and availability. In making effort to increase the existence of watershed ecosystem, the quantitative of water balance model can be carried out using the economic principle, such as watershed is as the producer; hydro electrical power, regional drinking water company and irrigation area are as the customers of environmental service acceptors. As the side that has the rights of service or produced goods, the watershed does not accept the payment. However, the accepted value will be use to increase the existence by increasing the service quality and quantity that is able to be used through the conservation activity.

The financing of conservation activity through the mechanism of environmental service can be seen as the investment of environmental service user in making effort to maintain the sustainability of belonging system (hydro electrical power), regional drinking water company, irrigation area, etc.). By viewing the payment of environmental service as the incoming investment, it is hoped that the implementation of environmental service can be done as well as the sustainability of water resources system (environment).

The condition makes the hydro electrical power, raw water supply, and irrigation area experience loss (it does not reach the production target). The less production of water user is caused by the loss of parts of the environmental service that can give benefit from it. To overcome the lack of electricity production, the Electrical Company (PLN) will spend the cost to generate the other energy resource. The spending cost is proportional with the loss of environmental service. When the environmental service can be optimally used, the spending cost by PLN for fulfilling

the production target can be called as the environmental service cost. The concept is known as the replacement cost.

The method used in this study is experiment with simulation. The experiment is carried out by analysing the component condition of water catchment area. However, since it is related to a long term period and a wide range of area, the experiment is indirectly carried out using a simulation. To be able to conduct it in a system area, it needs a model that can represent the system condition. Then, to obtain the model that represent the system condition such as watershed system, it can be carried out by evaluating and studying the performance data of watershed modeled. Therefore, the steps of the research will be as follows: 1) the analysis of the supporting components of the hydro watershed function, 2) the analysis of the water availability and need of Tuntang watershed, 3) the analysis for the water demand, 4) the economic valuation of environment services, 5) the formulations of the water balance model, and 6) the model simulation.

Based on the analysis result of watershed system, it is developed a model that consists of some sub-systems such as 1) hydrologic function sub-system: the one that will find out what variables that effect the hydrological function of water catchment area (DTA) to obtain the variable value of hydrologic function by using the approach of USLE and Mock Model; 2) water demand sub-system: the one that handles the analysis of domestic and non domestic water demand, water demand for hydro electrical power for a year as well as the project for the incoming year; 3) water availability sub-system: the one that intends to evaluate the distribution of water availability for times and to carry out the analysis after the conservation activity for the forecast water availability using the Mock Model; 4) quantitative sub-system on water user of environmental service in Rawapening Lake; 5) conservation sub-system; to carry out the analysis of conservation activity alternatives based on the characteristic data of water catchment area; and 6) investment sub-system on conservation activity of environmental service payment.

The result of the study indicated that the hydrologic function of Rawapening Lake water catchment area started decreasing. It is showed by the less percentage of rainfall that was infiltrated in 1997 from 78,38% to 49,94% in 2009. The Regime Coefficient of river from the flow data in 1995 to 2009 is 98,29, whereas the ability of the watershed to save water called Storage Coefficient indicated an increase. It meant that the ability of DTA to store water was decreasing. The analysis result using USLE method for the land use in 1996 and in 2003 indicated that the area experiencing a heavy land erosion was in the range of 13,5%, however in 2010 it reached 27,73%.

To improve the infiltration volume and decrease the potential land erosion once again, the alternative of conservation activity that is suggested is by building an absorption well. It intends to increase the volume of infiltration as well as to decrease the surface run-off so that the potential land erosion will decrease. The first priority of building an absorption well is in the residential area which is included in the potential

areas of heavy to very heavy land erosion. They include the Districts of Ambarawa, Banyubiru, and Bawen.

The cost of building the absorption well is taken from the environmental service value that has to be paid by the water users in the downstream of Rawapening Lake. In this study, the users are hydro electrical power (PLTA) of Jelok and Timo, raw water supply of PT Sarana Tirta Ungaran and irrigation areas. The analysis result of environmental service utilized by PLTA of Jelok and Timo is Rp 41,04/m^3, the raw water supply of PT Sarana Tirta Ungaran Rp 615,75/m^3, and the value of the environment services for water irrigation is Rp 4,31/m^3. The scheme of increasing the implementation on the payment of environmental service, it is suggested that the investment mechanism in financing the environmental service. The conservation activity of the absorption well is viewed as the investment activity in developing and maintaining the sustainability on business system of the environmental service.

The analysis result on the investment feasibility of the water resources conservation activity using the absorption well has reached the breakeven point at the end of the third year with the economic parameter as follows: IRR 13,39 %, NPV Rp 0,777 M and B/C Ratio 1,10. Based on the sensitivity analysis, when the financing is only carried out by PLTA and PT STU, the investment still remains feasible to be carried out if the areas built the absorption well are only in the region with a heavy to very heavy potential land erosion with the economic parameter value of IRR 13,39 %, NPV Rp 0,744 M and B/C Ratio 1,10. However, the obtained benefit experiences a decrease until the next six years, the investment still remains feasible with the break event point in the nineth year with the economic parameter of value IRR 11,96 %, NPV 2,785 M and B/C Ratio 1,36.

The use of Mock Model for the quantitative benefit of the conservation activity can be improved by using technology of GIS. The study on quantitative benefit of conservation activity is necessary to be developed to increase the certainty of environmental investment. In addition, the decrease of interest rate will also stimulate the activity of environmental investment.