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STATUS AND DEVELOPMENT OF PAYMENT WATERSHED SERVICES PROGRAM IN TAMAN HUTAN RAYA REGISTER 19, LAMPUNG PROVINCE

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ABSTRACT

Way Betung watershed which flow through the Tahura of Register 19 is one of the right areas for the development of Payment for Watershed Services (PWS). It was reasonable because the fluctuation of maximum/ minimum flow discharge of Way Betung watershed was relatively large (> 30) and it was the water sources for local water company (PDAM) of the provincial capital or Bandarlampung. Research was conducted on 270 samples in March to August 2015 in Way Betung watershed, forest area of register 19 in Lampung Province. The methods were RHA, WTP, WTA, social analysis, policy analysis and risk management. Based on the results, it is known that (1) The need for clean water in the city of Bandar Lampung in 2002 was 36.4 million m^3/year. (2) The communities are payment WTA in cash IDR 300,000 but also able to be paid in the form of in-kind such as providing trainings of silvi culture treatments. (3) Based on economic analysis, the household consumers, PDAM, hotels, and drinking water companies indicated WTP the water services to communities in the upstream by IDR 5,000 per month. (4) Water management policy in Tahura Register 19 has not been run well until now.

Keywords: Payment for Environmental Services, WTA, WTP, Water Regulation

1. INTRODUCTION

It is known that the Lampung Province is one of about 84 potential sites that considered as the development area for the environmental services in Indonesia, in terms of biodiversity, watershed protection, landscape beauty, and carbon sequestration (World Agroforestry Centre,

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2003). On the other hand, the rate of forest destruction in Lampung Province is so high. Consequently, more than 60% of the forest is not optimally functioned, and percentage of the poor people is in the range of 20.17 - 22.81% in 2004 (BPS, 2006)

Especially for Way WayBetung Watershed where located in Register 19 forest area is one of potential watersheds to be developed of PWS due to has function as the water source of PDAM (*Perusahaan Daerah Air Minum* or Drinking Water District Enterprise) for Bandarlampung or capital city of Lampung Province and also bottled water business as well. Also high population density surrounded this watershed will increase the pressure to water availability in forest area of Register 19. It means that it is necessary to conduct a study of the watershed environmental services mechanism development as one of the forest resource conservation and poverty reduction of the forest communities. Objectives of this study are as follows: (1) To know the potential development of Water PES from the Watershed in the Register 19, (2) To identify the appropriate Water PES schemes to be developed in the research sites that are accepted by the community and in accordance with potential there, and (3) To provide recommendations to the local government in the development of legal protection so that PES could operate well and support the sustainability of existing water resources.

2. MATERIALS AND METHODS

2.1 Research Site and Time

The research site is the Way WayBetung Sub Watershed in the Forest Area Register 19, Lampung Province. The research including planning, data analysis and report writing conducted by 6 (six) months, i.e. March–August2015.

2.2 Research Analysis

1. Hydrologi : Hydrological condition of Watershed is assessed using the 'Rapid Hydrological Appraisal (RHA)' (*'PenilaianCepatHidrologis'* = PCH) (Jeanes*et al.*, 2006).
2. Social Research Scope, Livelihoods and Risk Analysis: Exploration in this research is planned using the Rapid Rural Appraisal (RRA) and in-depth interviews to key informants (WWF-Indonesia, 2007).
3. Economic Value :Based on WWF-Indonesia (2007) this study calculated Willingness to Pay (WTP) and Willingness to Adopt (WTA).

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4. Legal Review: The discussion in this assessment focus on legislation and policies related to natural resource management and environmental services management in Indonesia (WWF-Indonesia, 2007) and also in Bandarlampung district and Lampung Province.

2.3 Number of Respondents

Based on the Slovin formula (Wulandari*et al.*, 2012), the minimum sample size is calculated by: 269.387 ≈ 270 respondents from out of 825 HH residences of TalangMulya, Parendoan and SumberAgung villages (KelurahanSumberAgung, 2011).

3. RESULTS AND DISCUSSIONS

3.1 Condition of Way Betung Hidrology

The condition of Way Betung watershed at present is start worrying, indicated by fluctuation of maximum/ minimum discharge of Way Betung watershed which is relatively high (> 30) (*Dinas PU Pengairan Provinsi Lampung,* 1998). Consequently, in the dry season Way Betung river is drought and in the rainy season has the potential to flood, this condition is disrupted the raw water supply to the local water company (PDAM) of Bandar Lampung City, so in the dry season, the water taps cannot flow continuously.

Based on the hidrology analysis, there is a shortage of clean water supply for Bandar Lampung City, especially during the dry season. This is due to changes in land use from forest to mixed farms, agricultural land, scrub and settlements in the upstream of Way Betung watershed.Changes in land use causing a decrease in infiltration capacity and increasing runoff. Then followed result will be lower the minimum average discharge of Way Betung river, which in turn lowers the supply of raw water to the PDAM of Bandar Lampung City.

3.2 The water needs of Bandar Lampung City

Lembaga Penelitian Unila (2003) reported that the clean water needs of Bandar Lampung City in 2002 was 36.4 million m^3/year, while the supply from PDAM was only 9.9 million m^3/year and groundwater supply was 20.9 million m^3/year, so it resulting in a deficit of 5.5 million m^3/year. Further, in line with the growth of population and industries, it is predicted that in 2010 the water deficit reached by 16.1 million m^3/year.

3.3 The Impacts of Land Changing to the Water Quantity in Way Betung

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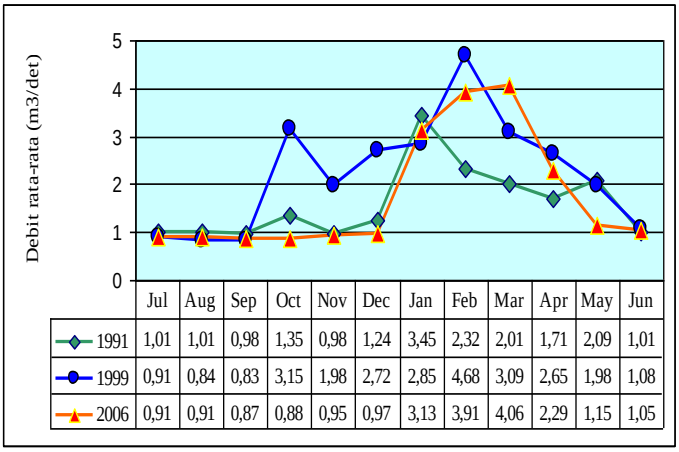
Changes in land use of Way Betung watershed are such as forest area decreased (Yuwono, 2011) from 16.7% (1991) to 7.2% (2006) and mixed farms increased from 48.6% (1991) to 52.2% (2006) which lead to increased annual runoff coefficient (C) from 48.6% (1991-1995) to 61.6% (2002-2006), an increase in the daily average maximum discharge (Qmax), an increase in the discharge fluctuation or river regime coefficient (KRS), but on the other hand decreasing the daily average minimum discharge (Q min). Changes in land use (1991-2006) by a decrease in forest cover and an increase in mixed farms cause changes in hydrological conditions, as shown by fluctuations in river discharge (flow hydrograph) (Figure 1).



	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
1991	1,01	1,01	0,98	1,35	0,98	1,24	3,45	2,32	2,01	1,71	2,09	1,01
1999	0,91	0,84	0,83	3,15	1,98	2,72	2,85	4,68	3,09	2,65	1,98	1,08
2006	0,91	0,91	0,87	0,88	0,95	0,97	3,13	3,91	4,06	2,29	1,15	1,05

Figure 1. Flows Hidrograph of Way Betungriver year 1991, 1999, and 2006

Source: Yuwono (2011)

The loss of water amounted 62.2 million m^3/year and by assuming of 50% can be sold by PDAM, then the loss water is equal to the value of IDR 102.6 billion/ year (water price of PDAM is IDR 3,300). This value is approximately equal to 5 times of PDAM revenue per year from the customer payments recorded in the water meter. Increasing extensive mixed farms (1991-2006) led to increased runoff. This is because in general, mixed farms are cultivated on the slopes of 15-40% and the tillers have not been applied an adequate soil and water conservation measures. Combination between the uses of mixed farms with relatively steep slopes without conservation measures led to an increased runoff. On the other hand this leads to decreased soil water storage so this will directly decreased the daily average minimum discharge. This is in line with the research of Agus, Gintings, and Noordwijk (2002) in Sumberjaya, the amount of runoff (including river discharge) is determined by the condition of topography, physical characteristics of soil and the quality of the land cover in a watershed.

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Decreasing in the forest cover is predicted to be the most responsible for the increase in Q max and decrease in Q min, based on the correlation value between the forest cover area (%) with Qmax and Qmin. The increasing of daily average maximum discharge (Qmax) of Way Betung River is because of decreasing forest cover area and increasing extensive mixed farms and settlements.

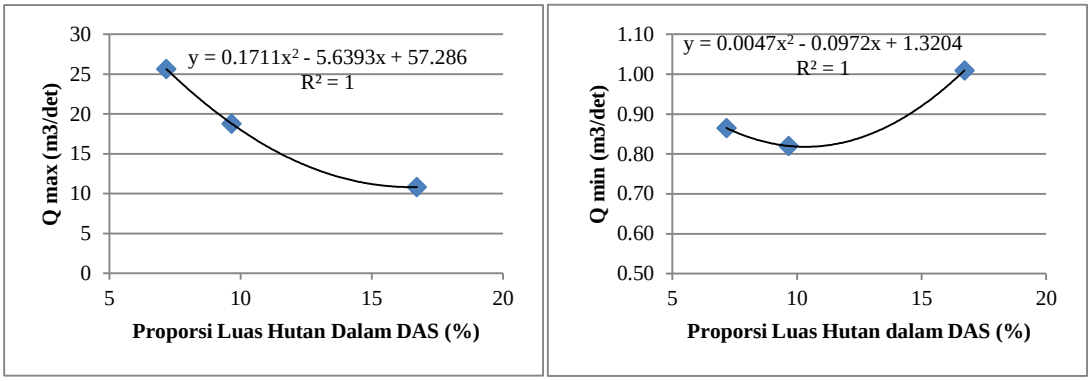

Figure: 2 (a) and 2 (b). Correlation between forest area (%) (1991-2006) to maximum recharge

Source: Yuwono (2011)

3.4 Planning of Development of DAS Way Betung

An increase the coefficient of river regime (KRS) or fluctuations of runoff from 9.7 in 1987 to 10.1 in 1988 and to be 13.1 in 1999 (Yuwono, 2011). This is because the agroforestry or mixed farms that applied causing some land to be open, thus impacted to the increase in runoff. Plan development of water resources of Way Betung watershed is arranged based on the calculation of minimum discharge in the following scenarios: Development of sustainable water resource planning that prepared under Act or *Undang Undang* (UU) No. 41 Year 1999 on Forestry or the Forestry Act No. 41 year 1999 article 18. The forest area that must be maintained at least 30% (thirty percent) of the watershed area with a proportional distribution added by soil conservation application (Agro technology)

in the use of mixed farming in the form of alley cropping. The basis of this scenario preparation is that the use of mixed farming land is relatively extended, and generally the tillers are there, so the application of agro technology (alley cropping) can be implemented. This scenario is capable to increase the water availability for PDAM customers up to reach 35.6% (Yuwono, 2011).

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3.5 Potency and Condition of Socio Economic and Culture

3.5.1 Watershed services provider

Based on the results of socio-economic analysis of the respondents in the three villages, it is known that the community has the potential to be the PWS services seller if the scheme of watershed environmental services will be implemented. The communities who have the potential to be the watershed seller are below the poverty line (BPS, 2012) and their life depend on the land area because their income is only IDR 190,000 per capita per month. In addition, there are 89% of respondents stated that they will always maintain the preservation of forests and watersheds. This is a good initial capital if in the future it will be implemented the PWS program.

3.5.2 Watershed services users

Downstream service users are those who have access or benefit from watershed services such as electricity and water supply which is sourced from the watershed (Smith *et al*, 2006). In this study, the parties that become direct users of watershed services is local water company (PDAM), the consumer of PDAM water is the household unit, packaged drinking water company (Tripanca and Great), jasmine class hotel (Wira Garden), entertainment/ tourism (Kedaton Earth Park) and the owner of the villa. The watershed services users are potential to be buyers if the PWS scheme will be implemented in the research area.

3.5.3 People perception about water

Based on the interviews results with 78% of respondents, the availability of water has not been a significant problem for the communities' life around Betung watershed. Only at certain times such as in the dry season, the volume or debit of water decreases, but the condition is still able to meet their daily needs and to irrigate the land although minimal. The reduced water debit from Betung watershed is also evidenced based on the research by Yuwono in 2011. In the research area, 86% of respondents have the facilities of land maintenance such as water supply and road access so that when the dry season comes, they can still manage their land activities routinely. Based on the statement of 93% respondents, it is known that in around Betung watershed has been a difference of quantity and quality of water between the past and present (in the duration of 20 years).

3.5.4 *Willingness to Adopt* (WTA), *Willingness to Pay* (WTP) and Social Capital

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According to 74% of respondents, the land tenure issues and the limited skills will also affect the sustainability of the program. Taking into account the constraints faced, based on the calculations on the primary data, it is known that 93% of the community around the forest area of register 19 has the WTA as service providers of Way Betung watershed in which if converted would be equivalent to the value of IDR 300,000 per month. Besides in the form of cash, about 88% of respondents are also willing to accept compensation in the form of in-kind such as nutmeg seed, providing seeds which are capable of storing water well and training of nurseries or other training which relevant to the efforts of soil and water conservation which suitable for Way Betung watershed. People and private sector stated of their WTP is Rp 5.000. The results of interviews with 98% of respondents indicated that the communities around the register 19 forest areas are quite active in the groups both as the board as well as the members; it means that the social capital is quite good.

4. POLICY STATUS

4.1 Public awareness of rules on water use

There are 67% of respondents who had an understanding that absence of the rule on water use does not provide any impact or threat to their life. However, there are 33% of respondents who said that it requires the policies of water use in Way Betung watershed. It is known that there are 37% of respondents agreed on the existence of rules on water use limitation by each household.

Policy at the government level, especially in the Forestry Service and Public Works Service, obtained information that, so far, these relevant agencies did not involve in the process of policy making on water management. The existence of this gap could be the first step that must be diluted first before the other things if there will be developed a policy on PWS. By no response in the water management question about the policies that exist at the government level, the Forestry Service (including *Unit Pelaksana Teknis Daerah* (UPTD) of Forest Park) and the Public Works Service, indicated that the issue of water management or water policy has not become part of their “tupoksi” (principal duty and function), so that these agencies tend to be passive, and have fears of violating their duties (tupoksi). So far, there is no problem with the hotel businessman which directly as the users of watershed services of Way Betung, because the water resource relies on wells water and partly from PDAM. The model of water management is not all the water is wasted but partly is reprocessed for other purposes, such as for watering plants and washing. They argued that they don’t mind if there are development of policies on the use of watershed services, if it in accordance with existing government rules.

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As much as 85% of the community stated that the water quality is still good or meets the standards of adequate drinking water, but the continuity has not been satisfied the customers. The socialization media usually only use the photocopy paper which are distributed to the community, without any clear mechanism for complaint process. Associated with the partnership, 74% of the community of PDAM users do not know much and ignore associated to the processes of water supply from water sources.

5. POLICY ANALYSIS WHICH RELEVANT TO PWS

Based on legislation of water resources (Act No. 7 Year 2004), the regulation and the responsibility of water power resource by the government and territory. This laws gives water soil management authority to the village government as far as the authority has not been done by the community or the local government. The PP (*Peraturan Pemerintah* or Government Regulation) No. 3 year 2008 stated that the central, provincial and district has the authority on the issuance of licenses associated to Business License of Utilization for Environmental Services (*Izin Usaha Pemanfaatan Jasa Lingkungan* or IUPJL) which is adjusted to the authority line based on the working area of utilization forest.

Exception for the nature preserves area, wilderness zone, and core zone in the national park as mentioned above, is set further in the Act No. 5 year 1990 on Conservation of Natural Resources and its Ecosystems, and regulated in more detail in PP. No 68 year 1998 which was revised to PP. No. 28 year 2011 on the nature reserves areas and conservation areas. In Article 36 PP No. 28 year 2011 stated that Tahura or Forest Parks can be used for: e. utilization of plants and wildlife in order to support cultivation in the form of germplasm provision; Therefore, it is justified that the development of watershed environmental services can be developed in Forest Parks, including those in Register 19. Its regulation item supported by article 6 (2) on Permenhut (*Peraturan Menteri Kehutanan* or Forestry Ministry Regulation) No. P.85 year 2014.

As a basis of management of watershed services at the site level studies have been published the Perda (*Peraturan Daerah* or Provincial Regulation) No. 3 of 2012 on Collaborative Management of Forest Park Wan Abdul Rachman Lampung Province. According to this regulation, in principle, the development of PWS can be implemented in Tahura WAR. This article is reinforced by Article 23 which states that the area utilization Tahura aims to benefit proceeds and other environmental services for the public welfare and nature conservation area, without changing the function Tahura.

6. THE PWS SCHEMES THAT COULD BE DEVELOPED

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Based on the analysis of socio-economic conditions, cultural and natural resources that are relevant to the development of PWS, then it is recommended that the development of PWS could be implemented at the research sites by considering to the limitations in that sites. The understanding on limitations of the sellers or the buyers will require intensive socialization to both. In addition, it needs socialization to the local government of Forest Park UPT and other agencies which will play the role towards the development of PWS.

Socialization to the sellers is required in order to disseminate the PWS scheme to make it running well according to plan without any deviation that would failed this implementation. One possible deviation that may occur is that the use of the funds "incash" which comes from the buyer will be used for other purposes and not appropriate to the purpose in conserving the critical areas around the Way Betung watershed. This could happen if the form of incentive is incash. But if the form of incentive is inkind, then the possible deviation which may occur is that the incentives is not suitable with the PWS scheme because this could be in the form of school buildings and others which don't have the impact on the sustainability of water resources in Way Betung watershed.

It is need socialization for the buyers, since based on the survey results, it is revealed that they have not stated clearly about the form of incentives on the watershed services that they have used. The buyers such as hotel or villa businessman and households of PDAM consumers just stated about the incentives in the form of money of IDR 5,000 per month. While buyers such as drinking water entrepreneurs, so far had just provide incentives in the form of "inkind", such as rehabilitation or planting trees around their company areas, as well as the charity activities. Furthermore, socialization to local governments of Forest Park UPT is intended to provide a proper understanding on the implementation of the PWS in the Way Betung watershed. Thus this will be able to guarantee the implementation of the sustainable PWS program and positively impacted on the conservation efforts of Way Betung watershed and the welfare of the communities who play as the sellers.

An assurance that can be used as a basis for the sustainability of the PWS program is to make it possible for the development of policies that support this program, e.g. preparation of local regulation on the PES in the provincial or district level. This policy may be proposed by the Local Government to be developed in the Lampung Province because this local government has had a true understanding about the PWS. The policy of PES needs to be prepared because it could be the policy umbrella for the PWS, since this scheme is under the PES schemes besides carbon services, biodiversity and landscape beauty. After socialization, then required a capacity building program for the sellers, buyers and institutions of PWS managers to monitor and ensure

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that the PWS program running as well and in accordance with the agreement between the buyers and the sellers in a period of time.

Further is the formation of the PWS Management Board which is consist of stakeholders and refers to Local Government Regulation or *Peraturan Daerah* or *Perda* No. 3 year 2012, so the Board of Forest Park Collaboration could also be the Boards of PWS Management. The presence of one institution with two functions in playing a role is an efficient and effective step, because the existing institutions should continue to actively play a role in the sustainable management of Forest Park. If the Forest Park sustain, then all the water sources in it will also works properly, including the Way Betung Watershed. Then the next step, conduct a negotiation between the buyers and the sellers to obtain an agreement on the implementation of PWS program e.g. about the rights and responsibilities as well as the role that clearly specified between the buyers and the sellers, implementation mechanisms, the amount and the form of incentives and the period of implementation. Simultaneously, conducted the development of PWS services policy which have to be full of support from the local government (*Peraturan Daerah* or Perda) at the provincial or district level, because Perda is able to be developed at the provincial or district level. Development of new regulation in local, particularly for Tahura should be on basis Permenhut No.85 year 2014.

In addition, the watershed does not recognize government administrative boundaries, so in the preparation, there must be active participation from local government of districts which is passed through the watershed flows. When developing a policy, there must be active participation from the buyers and the sellers because they are indeed as the main actors in the implementation of PWS schemes, and the sustainable of watershed is not only the responsibility of local government alone.

7. CONCLUSIONS

(1) At present, the condition of Way Betung watershed is start worrying, indicated by fluctuation of maximum/ minimum discharge of Way Betung watershed which is relatively high (> 30).

(2) Activities of forest encroacher farmers and CF in general have not been applying the adequate principles of soil and water conservation (agro technology). These conditions either directly or indirectly caused the decreasing of hydrological conditions in Way Betung watershed. This is shown by a decrease in the average minimum discharge of Way Betung River from 1.1 m^3/ sec in 1997 to 0.9 m^3/ sec in 2002.

(3) The need of clean water in Bandar Lampung City in 2002 was 36.4 million m^3/ year, while the supply from PDAM was only 9.9 million m^3/ year and groundwater supply was 20.9 million

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m^3/ year, so it resulting in a deficit of 5.5 million m^3/ year. Further, in line with the growth of population and industries, it is predicted that in 2010 the water deficit reached by 16.1 million m^3/year. Due to limited supply of clean water from PDAM, the people make a dug wells (shallow) and the artesian wells (deep) to meet the water needs.

(4) In this study, potential participants as watershed service providers are user communities or land users who live in the upstream of Way Betung sub-watershed which is located around register 19. Based on the results of socio-economic analysis of the respondents in the three villages, the communities were below the poverty line and their life depend on the land area

(5) Taking into account the constraints faced, the communities around the register 19 forest area are willing to be the watershed service providers with paid of IDR 300,000 per month. In addition, the consideration of the increasing communities' life needs and the low economic ability also affect the communities in determining the WTA. Beside payment in cash, the communities are also able to be paid in the form of in-kind such as providing nutmeg seed, providing plant seeds that are capable of storing water well and providing trainings of seedlings.

(6) Based on the interview with the household consumers, hotels, PDAM and drinking water companies, the household consumers are willing to pay for (WTP) the water services to communities in the upstream by IDR 5,000 per month. Furthermore, the companies are willing to provide compensation in the form of tree seedlings to the community and to plant trees in the upstream (around the companies' area).

(7) The policy of water management in Gunung Betung has not been run well until now, even the concept of partnership and common management of water resources haven't have a strong agreement. Sectoral view makes the understanding concept of the environment as an integrated system less well understood.

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