

Factors affecting payments for environmental services (PES) implementation in the Garang watershed management

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Abstract. Watersheds has essential functions in human life and other living things that include hydrological and ecological functions. However, the number of critical watershed conditions are increasing and resulting in the degradation of the watershed function. The number of critical watersheds according to the 2009 forestry ministerial decree is 108 watersheds including Garang watershed. The landscape degradation of the upper areas will significantly affect hydrological conditions in downstream areas. Payment for environmental services (PES) is one of the alternatives of watershed management that combines interests in the upstream - downstream watersheds, especially in the form of water distribution. This study aims to identify important factors or criteria needed, especially related to the water environment services as a part of the integrated watershed management. The qualitative and quantitative method was used in this study with descriptive and CVM analysis used through the review literature, interview and survey. The analysis identifies important factors for PES in a sustainable watershed management which include its context, actors, financing systems, operations, and monitoring evaluation. The study also shows that some factors need improvement such as context (local regulation), actors (public understanding of the PES mechanism), operation (planning design), and low willingness to pay for PES implementation in Garang watershed. By properly defining the criteria of PES, watershed management can be managed in a way that the upper and downstream areas can be linked in an integrated way.

1 Introduction

Hydrologically, watershed have three main function, first as catchment area, second as water storing and the last is as water releasing. Ecologically, watershed has function as area for important chemical reactions and habitat for flora and fauna [1]. It shows the important function of watershed as main source of water for human and other creatures. Minister of Forestry Decree Number 511/Menhut-V/2011 concerning Determination of Watershed Maps, stated that Indonesia have 17.088 watersheds [2]. However, the number of critical watersheds keep increasing in the last five years. It caused decreasing function of watersheds. The decreasing of quality and quantity is occurring at most areas in Indonesia [3]. Changes of carrying capacity of watersheds are the impacts of uncontrolled land use without appropriately applying principles of soil and water conservation.

Ministry of Environment and Forestry's data states that the condition of critical watersheds from 22 watersheds in 1984, then increasing to 39 watersheds in 1992, and 62 watersheds in 2005 [4]. Currently, 108 watersheds have become priority watersheds based on the Minister of Forestry Decree Number 328/Menhut-II/2009. The regulation aims to rehabilitate, reclaim forests, and save watersheds [5]. One of the critical priority watersheds is Garang watershed. During the period 1995-2010, there was a change in land use in

Garang Hulu watershed. It covers 27.24 km² or 44.24% of its total area. The initial function of land as a protected area turn into farmland, settlements, and industry [6]. Environmental degradation in the upstream has affected the downstream areas related to water problem. Therefore, it requires management improvement.

Watershed management according to Government Regulation Number 37 of 2012 is a human effort in regulating reciprocal relationship between natural resources and humans in watershed and all their activities, to realize ecosystem sustainability and harmony also increase the benefits of natural human resources in a sustainable way [7]. The alternative watershed management conservation systems that thriving is the payment for environmental services (PES) mechanism which integrates watersheds in the upstream-downstream, regarding to water utilization. This mechanism is one of the environmental economic instruments that have been regulated in Law Number 32 of 2009 concerning Environmental Protection and Management (UUPPLH) [8]. In addition, Payments for Environmental Services (PES) in watershed protection is one of the environmental services most often practiced besides carbon sequestration, natural beauty and biodiversity protection. The PES becomes attractive due to problems encouragement in conservation and requires a different approach.

The PES in watershed management is a realization of a market mechanism to compensate upstream land owners for maintaining or modifying certain land uses that can affect the availability and or quality of water resources downstream. The compensation generated from downstream water users [9]. PES has an ability to connect upstream-downstream interests, therefore it will involve several parties for its implementation. The PES mechanism also has requirements that must be met in its application so that the identification of these criteria or factors is absolutely necessary. It is to ensure that the future implementation process suitable with the right PES implementation practices. The learning process in implementing the PES mechanism needs to be continuously carried out to determine best practices and the existing PES mechanism to serve as a guide in finding PES success factors to decrease the failure risk of PES implementation. Based on this illustration, this study aims to describe the PES factors that play an important role in realizing the successful of PES. This article will identify factors as important requirements in PES implementation, especially in watershed management and how the local factors are affecting PES implementation in the Garang watershed Management.

2 Research Method

This study was conducted using qualitative and quantitative approaches using literature reviews, interviews and surveys. The combined research method will provide a more comprehensive understanding and analysis results because it involves quantitative and qualitative data collection approaches, as well as combining two forms of data [10]. In addition, this study was conducted in the Garang watershed in Central Java Province, Indonesia (Figure 1). This watershed is important for water supply especially to the most area of Semarang City managed by local water company i.e. PDAM (commercial drinking water company) Tirta Moedal. The PES implementation will support the sustainability of water supply.

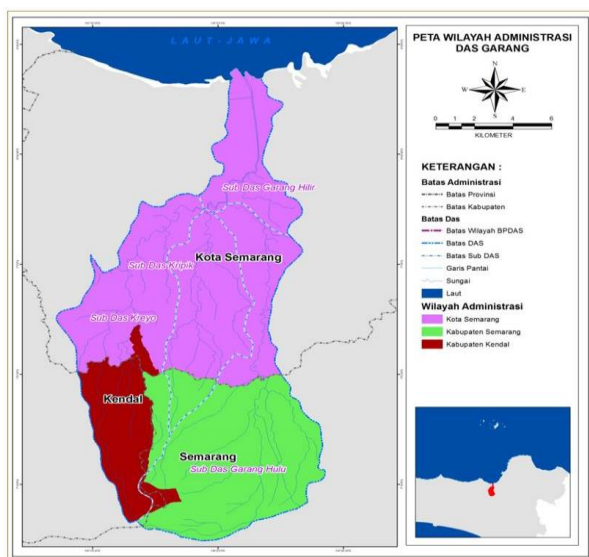


Fig. 1. The Garang Watershed, Central Java, Indonesia

The descriptive analysis was carried out on existing concepts in various PES-related publications and journals related to PES such as the wunder concept, recommendations from the results of The Third Latin American Congress on Watershed Management, and lesson learned implementation of PES in Cidanau. In addition, the analysis is also complemented by survey results and interviews to obtain a grounded understanding of the PES factors. The survey was conducted on 16 different informants by purposive sampling, especially those involved in the management of the Garang watershed where this study was conducted including government and non-government as shown in the Table 1.

Table 1. Stakholders in Garang watershed management

No.	Government Institution	No.	Non-Government Institution
1	Bappeda Central Java Province	1	Watershed forum in provincial level
2	DLHK Central Java Province		
3	DIPUSDATARU Central Java Province	2	Garang Watershed forum
4	Department of Agriculture and Plantation Central Java Province	3	Bintari's foundation
5	BPDASHL Pemali, Iratun	4	Upstream farmer groups (Gogik Village, Kalisidi Village, and Lersep Village).
6	BBWS Pemali, Juana		
7	DLH Semarang City		
8	DLH Semarang District		
9	DLH Kendal District		
10	PDAM Tirta Moedal		

Source: Data analysis, 2020

The survey was aim to determine the response of stakeholders to the factors regarding PES implementation in Garang watershed. The survey includes five variables which are important PES factors. Those variables then derived into eighteen parameters to support the PES implementation in Garang watershed. Furthermore, the results are made in the form of a percentage by obtaining a parameter score from the results of the division between the answer scale value and the largest answer value. The limitation of the factor value is less than 60% which needs to be focused to encourage PES implementation.

The Contingent Valuation Method (CVM) analysis is used to determine the willingness to pay (WTP) from the community [11]. This analysis is an approach based on a survey by knowing the willingness to pay directly from respondents. This analysis used to assess non-market goods and services [12]. WTP becomes an economic assessment related to the financing system factor in PES. The survey of WTP conduct to 100 household customers of PDAM Tirta Moedal in the central and western areas of Semarang City. The estimated WTP is calculated using the average value [13-14].

The data and information used for all analysis are based on field observation and interviews using structured questionnaires. These data were collected followed by conducting desk and literature studies.

3 Result And Discussion

Factors affecting PES are needed as a prerequisite for the development of the PES implementation in the

watershed management system. Empirical studies indicated that important factors for the PES to be implemented required the identification of the following: the context, actors involved, payment scheme, mechanism and its operation, and monitoring and evaluation. In addition, the result of this study shows that some factors need to be improved on the PES implementation in the Garang watershed are the regulation context, actors (participation), operation (planning design), and low willingness to pay (WTP) because 53% were unwilling to pay for the PES. The interview results in the calculation of parameters for each factor, namely 59% of respondents agree that the formal regulatory context has supported PES, public understanding of PES is around 50%, and 57% respondents agree that there is already a PES planning design. The assessment of WTP for 100 household customers resulting in the following: the population sampled willingness to pay of the customers for environmental services was around Rp2.970,00 or only 47%, which is still considerably low.

The following are five factors affecting PES that need to be considered in the implementation of PES with particular interest in the management of Garang watershed. *First*, the context includes a strong foundation, the goal of PES implementation as the driving force for the PES mechanism. Based on land conditions data in Garang watershed as shown in Table 1, it is necessary to get serious attention to improve its 53,76% lands condition (rather critical, critical, and very critical lands). It can be strong foundation for PES implementation to restore Garang watershed condition.

Table 2. Critical lands at the Garang watershed in 2017

(in hectare)						
No.	Region	Not critical	Potential critical	Rather critical	Critical	Very critical
1	Kendal District	0,00	78,8	1716,49	50,20	822,77
2	Semarang District	1473,65	1089,15	3161,17	628,32	874,35
3	Semarang City	4864,17	2268,00	4097,37	11,22	0,00
	Total	6337,82	3435,42	8975,03	689,74	1697,12
	Percentage	29,99%	16,25%	42,47%	3,26%	8,03%
						100%

Source: BPDASHL Pemali Jratun, 2020

Based on the opinion of most informants that the idea of PES Garang watershed has been understood by stakeholders. In addition, participation of stakeholders through participatory governance (government and non government sector), from the experience in ecosystem based management [15], and policy in a regional regulations make PES implementation easier [16]. *Second*, identification of actors involved in PES implementation includes parties directly related to PES such as environmental service providers, environmental service users, intermediary institutions, and facilitators. Intermediary institutions are important actors in facilitating and supporting of PES, and a multisectoral approach is needed for a more effective PES implementation namely Garang watershed forum and agencies who have authority in Garang watershed management (Department of Environmental and Forestry Central Java Province and Regional Office of River Area Pemali Juana). *Third*, financing systems

include estimating and determining the value of willingness to pay from service users in PES for payments to upstream farmers, and other transaction costs. This assessment is used to find out how much financial value is able to support the running of PES. Nevertheless, the WTP analysis shows a value of Rp2.970,00 per household per month or only 47% of the population sampled is willing to pay for PES. It's mean PES still needs to increase its funding sources. *Four*, operation includes planning for PES such as environmental services to be built, and formulation of agreements. Some fundamental elements for PES agreement are service provided, compensation, monitoring and compliance, governance and management, rules for modifying and adapting the contract [17, 18]. In addition, the payment scheme for watershed services requires a clear and precise flow of transactions in order to enforce the PES mechanism at field level. Without this understanding and agreement from all parties, the payment scheme will not be operated successfully because it will erode trust among stakeholders. The key is effective institutions with clear defined roles, who does what and reliable contract law, supported by good governance practices, effective transaction capacity and credible enforcement.

Fifth, regular monitoring and evaluation includes what need to be evaluated, who will conduct the evaluation and documentation of the evaluation results. Monitoring and evaluation is an important part of ensuring compliance and enforcement of the rule for payment scheme, including sanctions if parties fail to comply with their commitments. The results of monitoring and evaluation are used to support learning and management adjustments to PES implementation strategies, mechanism, and procedures.

PES implementation in watershed management has emerged and developed in many countries to maintain the sustainability of watershed ecosystems. It become source knowledge for regions that want to add PES by learning existing experiences for successful implementation. Defining the various PES factors will help PES implementation in the watershed management.

3.1 Important factors in PES

Wunder provides an understanding of PES which includes five important criteria in PES, i.e. voluntary transactions, a clear definition of environmental services, at least one buyer and one seller, and conditionality [19]. However, a more completed concept of PES in watershed management has been recommended at the regional forum of The Third Latin American Congress on watershed management in 2003. This conference has grouped several criteria as important factors of PES in watershed management into five categories as follow: context; actors; valuation, financing and costs; operation and design of the scheme; and monitoring and follow up [9].

PES in Cidanau provides practical lessons for implementing PES in watershed management. An important highlight of PES in Cidanau is the existence

of an intermediary institution (Forum Komunikasi DAS Cidanau/FKDC) which plays a major role in the development of a PES mechanism to manage the Cidanau watersheds by emphasizing the coordination function. The forum can be an intermediary institution consisting of multi-stakeholders namely the watershed communication forum. The intermediary agencies can come from the government, NGOs, private enterprises, or multi stakeholder agencies. Intermediaries not only facilitate transactions but also act as links for a broader development agenda, and accommodate the various interests of the parties involved in the landscape [20].

3.2 Important factors to encourage the implementation of PES in the Garang watershed

Garang watershed is potential to implement PES to improve its critical condition. However, before PES implementation, it is essential to define the important factors. Surveys and interviews were conducted by giving questions related to five important factors in PES as variables which include its context, actors, payment systems, operation, and monitoring. These variables have been detailed into several parameters to encourage PES implementation.

Tabel 3. Analysis of important PES factors in the Garang watershed

No.	Important factor variables	Parameters	Result of parameter analysis
1	Contexts	a. Knowledge of PES	82%
		b. Local regulatory supports about PES	59%
		c. Stakeholders participation	86%
		d. Ecosystem based management	78%
		e. PES implementation needs (timing)	90%
2	Actors	a. Stakeholder roles	74%
		b. Public understanding of PES	50%
		c. Source of funds	62%
		d. Intermediary institutions	77%
3	Financing systems	a. The payment value based on an agreement	76%
		b. Payment scheme	84%
4	Operation	a. Planning design of PES	57%
		b. Agreements	89%
		c. Use of compensation funds	89%
		d. Conflict handling rules	91%
5	Monitoring and evaluation	a. Mechanism for performance assessments	92%
		b. Aspects being evaluated	93%
		c. Documentation of monitoring results	95%

Source: Data analysis, 2020

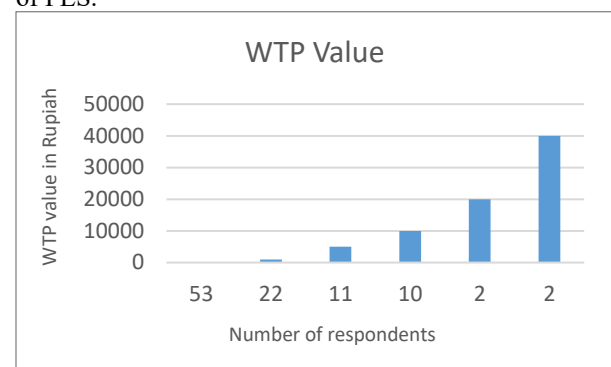
The analysis results show that there is some value below 60% including formal regulatory support, public understanding of PES, and planning design with explanation:

- Formal regulatory support with a score of 59% because regulations concerning PES have not been made at the local level, especially PES in Garang management watershed. Local regulations will support PES implementation, so it needs to be formulated as a legal support for stakeholders start working.
- Public understanding with a score of 50%. The stakeholders argue many people do not know about PES. This condition is strengthened by the result of

a survey to 100 PDAM customers which stated that 85% of the customers do not know about PES.

- The absence of planning design to implement PES in Garang watershed can slow down its implementation. It's score 57%, so an initiator for the planning is needed. However, the integrated Garang watershed planning (RPDAST) of 2012 has stated that the PES mechanism is one aspect of watershed management that will be developed [21]. This indicates that PES requires concrete efforts and consistency from the related parties who have the authority to be realized.

Beside the parameters above, we also need to considered the parameter of the source of funds which score 62%. It reflects that potential sources of financing need to be further identified because the willingness to pay is one of the keys to the successful implementation of PES.



Source: Data analysis, 2020

Fig. 2. WTP of water customers

The chart above shows that the most of respondents who are willing to pay is less than those who are not willing to pay. Thus, the support for PES is still low. The respondent's reason was because the cost had become part of the water bill so it was corporate's responsibility, and the increasing difficult economic situation. Furthermore, the analysis of the mean WTP from the community (household customers) for PES implementation in the Garang watershed is Rp 2.970,00 per household per month.

Tabel 4. Distribution of willingness to pay

No.	Value in Rupiah (W_i)	Frequency (P_i)	Total WTP ($W_i \times P_i$)
1	0	53	0
2	1.000	22	22.000
3	5.000	11	55.000
4	10.000	10	100.000
5	20.000	2	40.000
6	40.000	2	80.000
	Total	100	297.000
	Average (per household per month)		2.970

Source: Data analysis, 2020

PES as an environmental management instrument can be implemented well if the formulation of factors as PES criteria is defined appropriately. Furthermore, this effort is made in order to achieve the objectives of watershed management. The objectives of watershed management are to realize a) guaranteed sustainable use of natural resources on a watershed scale, b) attain an ecological balance as a life support system, c) guarantee the quantity and quality of water throughout the year, d)

control of surface runoff and flooding, and e) erosion control land and other land degradation processes [22]. Thus, watershed management which includes its utilization and protection can be carried out in such a way by connecting the interests of the upstream and downstream areas in an integrated way to realize better watershed management.

4 Conclusion

Payments for ecosystem services (PES) is one of an alternative important policy framework in a sustainable watersheds management. This study shows some important factors as required in the PES implementation, especially for the Garang watershed management as follows:

1. The important factors including the hecontext, which is mainly based on the basis and objectives of PES implementation, actors involved in the PES scheme, financing systems, operations, and monitoring evaluation of the PES.
2. The Garang watershed has the potential to implement the PES, but the analysis results show that there are important PES factors that need to be the focus of attention including context (local regulation), actors (public understanding of the PES mechanism), operation (PES planning design), and the low willingness of the community to pay.

Thus, defining the important factors of the PES appropriately will support the achievement of the sustainable watershed management objectives.

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