Community-Based Environmental Management Through The Payments for Environmental Services Program in Cidanau Watershed, Banten Province, Indonesia

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Abstract. Payments for Environmental Services (PES) are seen as an effort to preserve and used environmentally sustainable manner. The program is believed to bridge two different interests, such as the people who inhabit in the upstream watershed who are generally poor farmers with land holding less than one hectare with urban communities. The purpose of this paper is to describe the implementation of PES in Cidanau watershed. The field data were processed using descriptive qualitative method. The results showed that PES in Cidanau watershed started in 2003 and has entered phase two (the second 5 years), followed by 15 farmer groups to target land area of 520 hectares. The value of contracts signed through a memorandum of agreement with PT. KTI as a buyer to a group of farmer-members (sellers) through Communication Forum of Cidanau watershed (FKDC) as organizational managers is IDR 4 billion for 2019. For farmer groups of an initial contract for five years was paid IDR 1.2 million per hectare per year will increase to 1.75 million per hectare per year for five-years contract. The implementation of PES in Cidanau watershed relatively was well proved by increasing number of farmers who are interested in becoming participants of PES. The implications of PES program for environment are increased forest cover and maintained water discharge. In addition, the program has increased income for farmers in upstream watershed.

1. Introduction

Forest resources and watersheds in Indonesia are less contributing to poverty reduction, socio-economic, development, and environmental sustainability. In some areas the forest has been degraded, fragmented, and destroyed. In recent years, Indonesia has lost its forest area to two million hectares per year. Most of those, caused by illegal logging and land conversion. In general, the conversion of forest land is used for agricultural land. With the loss of forest has undermined the rural livelihoods of people, ecosystem services, and Indonesia’s ability to achieve poverty reduction goals [1]. In forestry sector, Indonesia is well known in international as third largest country of forest area degradation [2]. Many efforts have been made to address forestry problem in Indonesia. However, the results of these effort still not good as expected. Initial watershed management mostly uses a physical and self-directed approaching, have been done by government agencies, NGOs, and general public. Since the last ten years, it has started with a holistic approaching, involves all stakeholders.

Forest have an important role in watershed system. In hydrologic cycle, forest roled as containers or water tanks and watershed roled as water distributors through main rivers and rivers. The water’s availability in
watershed are influenced by physical condition of watershed. Watersheds in Java Island are generally short (30-70 km), narrow and steep, the average extent of less than 250 km². Based on ReppProT’s report, more than 70% of land area of Java has become a settlement and cultivation area. The widest of land in Java is used for wetland cultivation, following plantations, settlements, shrubs and forest. Plantation forest are categorized as plantations and other perennials, whereas forest are contained on the mountains form as natural vegetation in protected forest [3].

Cidanau watershed’s conditions are not different from other watersheds in Java Island. Forest encroachment and conversion of forest land for agriculture have been occurred in Cidanau watershed, even settlements in form of claves have existed in forest areas. If the situation still remain, it would allowed to disrupt water system and disturb environment.

Cidanau River Basin is one of the most important watersheds in Banten. In this watershed, the water of Cidanau river are used as raw material to be processed into clean water. Clean water are needed to meet the needs of more than 120 large industries and to meet domestic water needs in Cilegon City. The clean water’s needs must be met constantly at all time regardless of season. Diruption of the supply of clean water will disrupt the smoothness of city life and will even cripple industrial activity in this area. The industrial sector in Cilegon is the heart of Banten’s economy. In Cilegon, there is hundreds major national industries, especially industrial groups of Krakatau Steel and other large industries. In fact, these raw water supplies are physically affected by local weather and climate conditions. In rainy season, the river is abundant and even not utilized, otherwise in dry season the water discharge becomes receded due to reduced rainfall. Fluctuations in water discharge will be great. In order to discharge the river is not too fluctuating, it needs protection or conservation for water catchment areas in upstream of Cidanau river basin. Therefore, it is necessary for integrated watershed management involving stakeholders, including downstream river communities (mostly farmers) who maintain forest and perennials others as water service providers, local government and related agencies and institutions, and Non-Governmental Organizations (NGOs).

Based on the problems, it is necessary to have integrated watershed management for the sustainability of sustainable watershed resources by involving all parties. One form of community-based integrated management of watersheds is Payment for Environmental Services (PES) program. The program is expected to achieve a win-win solution of watershed management between communities in the downstream watershed as users of environmental services and upstream watershed communities as environmental service providers, especially water services.

Payments for environmental services (PES) are one of these new approaches seeking to support positive environmental externalities through the transfer of financial resources from beneficiaries of certain environmental services to those who provide these services or are fiduciaries of environmental resources. Over the last decade, the use of PES schemes for watersheds, biodiversity, carbon sequestration, and beauty has gained popularity. More than 300 PES schemes have been inventoried in the world [4].

Wunder and Kanounnikoff make the following definition of the payment for environmental services: “... we define PES as (1) voluntary, (2) contingent transactions between (3) at least one-seller and (4) one buyer (5) over a well-defined ES or a land use likely to secure those services” [5]. The crucial point in the definition of Payments for Environmental Services (PES) is what the main concern of environmental services [6]. Other authors like Landell-Mills & Porras (2002) environmental services include diversity conservation, watershed rescue, panoramic beauty, and other service links [7].

Experience of PES program in Costa Rica, there are four types of PES directly influencing [8]:

1) Carbon sequestrian and storage, for example, a northern power company paying farmers for tropical crops they maintained.

2) Biodiversity protection for example, conversation donors pay local communities for their efforts in restoring the biological corridor areas.
3) Watershed protection, for example downstream watershed users pay farmers for their efforts to maintain their land used and minimal deforestation, erosion, flood risk, dan so on; and

4) The beauty of landscape baeuty (landscape beauty), for example the tourism service provides pay the local community for its efforts not to hunt wild animals and always maintain the lives of these wild animals.

According to Redondo-Brenese and Welsh report, the implementation of the PES program in Costa Rica was undertaken by the state by issuing the Forestry Act in 1996 [9]. The Forestry Act identifies a number of environmental services that can derived from natural forest, tree palantation, and agroforestry systems, which act as carbon fixation, hydrological services (such as reducing sludge in water supply for hydropower and groundwater), biodiversity portection, and natural beauty.

The experience of PES in Brazil, based on Rosa and Kandel (2002) reports, two things are done in Brazil in relation to rewards of environmental sevices, namely the extension of farmer’s rights (such as granting farmer’s rights to tap rubber on conservation land, tapping rights, compensation of a certain amount to the rubber farmers association for each kilogram of rubber tapped), and the other is to encourage non-destruction by focusing on traditional conservation (ecological taxes and granting acces for farming communityes to manage parks or graded areas) [10]. From an ecological-economic perspective Muradian (2010) adopted a broader definition by stating that PES is a “transfer of resources between social actors, with the aim of creating incentives to align individuals and/or use decisions land along with social interests in natural resource management” [11]. In this way, the writer moves beyond economic transactions to recognize the importance of considering the social context (e.g. institutional arrangements, cultural practices) in the introduced PES scheme, that the conditionally issue of most existing conservation initiatives will be labeles as PES in Latin America.

Pagiola, et al, (2005) suggest that PES may be able to reduce poverty through payments to upstream watershed communities due to their inability to manage the destructive natural resources surrounding them [8]. How much PES influences poverty reduction depends on the facts of poverty, the management of funds received, and how much the PES payments are. Although the PES program is not designed for poverty alleviation programs, it can be synergized with the design of poverty alleviation programs and possible local conditions.

During 2003-2012, RUPES Indonesia conducted six action-research projects at a number of sites. These locations are: (1) Bungo (Jambi province), (2) Singkarak (West Sumatra province), (3) Sumberjaya (Lampung province), (4) Cidanau (Banten province), (5) Lembang (West Java province), and (6) Kuningan (West Java province) [12].

2. Area of Study and Data
Cidanau watershed is located between 06°07’30” - 06°18’00” S and 105°48’00” – 106°04’00” E, an area dominated by mountains in North-West and lowlands to the South and East. Administratively, Cidanau watershed includes two districts of Serang District (5 subdistricts and 38 villages) and Pandeglang District (1 subdistrict and 4 villages) [13]. Cidanau river is the main river in Cidanau watershed which houses 18 sub-catchments in the area of 20,120 hectares. Cidanau River empties into Sunda Strait (Figure 1). The average annual rainfall that falls in Cidanau watershed is 2,650 mm. The tributaries that flow into Cidanau watershed are quite large, including Cisalakk, Cikalumpang, Cisumur, Cikarasak, Cibuntu, Cisaat, Ciapus, Cilahum, Ciamas, Cibarugbug, Cigalusun and Cirakah Gede rivers. This creates a dendritic flow pattern. These creeks all flow into Lake Swamp (Cidanau river upstream) which continously flows throughout the year with variation discharges, depending on the season [14].
Based on discharge data collected by Rahadian (2009), Cidanau river discharge has various characteristics and decreased the discharge from year to year. Cidanau river flow data between: 1922 to 1936, average monthly debit of Cidanau River was 11.29 m$^3$ per second with a maximum discharge of 44 m$^3$ per second and a minimum discharge of 1.48 m$^3$ per second [14]. From 1980 to 1992 average debit data was 7.36 m$^3$ per second with a maximum discharge of 38.12 m$^3$ per second and a minimum discharge of 1.20 m$^3$ per second. Average discharge from 1995 to 1997 was 9.97 m$^3$ per second with a maximum discharge of 26.44 m$^3$ per second and a minimum discharge of 1.76 m$^3$ per second.

Population problems are very influential on community activities that conducted in Cidanau, especially related to economic activities as the efforts to meet the needs of daily population. Much greater population, then the needs of natural resources in watershed will increase. Based on data from Rahadian (2009), 133,213 inhabitants are living in Cidanau watershed. The population growth rate at 3% per year. Density of agrarian population in Cidanau watershed is 26 people per hectare. Socio-economic conditions, especially upstream watershed communities, are still relatively low with the largest livelihoods are farmers [14].

3. Research Methods
The research has been conducted in 2016, located in Cidanau watershed in Banten province. The method of the research is qualitative method. The purposes of using this method is to create a systematic, factual and accurate description of facts and nature, and relationship between symptoms investigated. In this case, the object or focus on the research is to evaluate of the implementation of Payments for Environmental Services (PES) in Cidanau watershed, Banten.

The research data was obtained through in-depth interviews with several informants, namely: (1) forest farmer group in Tamanjaya Village, Ciomas sub-district, Serang District located in Cidanau upstream area which act as provider or seller of environmental services, (2) PT Krakatau Tirta Industri (PT KTI) is a company that processes clean water from the Cidanau river which acts as a buyer of environmental services, (3) Cidanau Watershed Communication Forum (FKDC) as intermediary services program, and
(4) Regional Development and Planning Board (Bappeda) of Banten Province, as facilitator and policy maker of PES program.

All interviews were recorded when the agreement was given, and then described according to the research objectives. Observation techniques are also used to gain insight into the PES mechanism in the Cidanau watershed. Researcher visits to several villages which are PES locations with the aim of knowing the implementation of the PES program and its impact on the physical environment and socio-economic conditions of the community. Qualitative research data is complemented by secondary data collection from public institutions (for example, population data, river discharge data, etc.), forest farmer groups (for example, MoU documents, land use, etc.), FKDC secretariat offices (for example, PES participants, land use patterns in the Cidanau watershed). Qualitative research data is complemented by secondary data collection from public institutions (for example, population data, river discharge data, etc.), forest farmer groups (for example, MoU documents, land use, etc.), FKDC secretariat offices (for example, PES participants, land use patterns in the Cidanau watershed).

4. Result and Discussions

4.1. Background and PES Mechanism

Payment for Environmental Services (PES) as one form of integrated management in Cidanau Watershed through a long road starting from the pioneer period since 1998 (before Banten province separated from West Java province) and its implementation started since 2004 (banten become its own province) until present. Based on FKDC (Rahadian, 2009) document cited by researchers, it shows that PES in Cidanau watershed historically started from survey that conducted by Isabel van de Sand, student exchange of Bogor Agricultural University (IPB) from Imperial College London in 2004 [14]. This survey conducted to 80 companies that use water services from PT Krakatau Tirta Industri (PT KTI) located in Cilegon City of Banten. Total of 56 companies who returned the questionnaire obtained the result that there is a willingness to contribute in the form of funds to support conservation activities in Cidanau watershed.

After going through several stages toward implementation of PES in watershed, it has taken three years to begin implementing development of upstream-downstream linkage models with the mechanism of environmental servis transactions. This process was pursued after collaboration of “Developing Upstream-Downstream Transactions for Watershed Protecton Services and Improved Livelihood Program” between Rokonvasi Bhumi (NGO) with Center of Study Development of Water and Land Resources – Institute for Research, Education, and Information of Economy and Social (PSDAL – LP3ES), with funding support from the International Institute for Environmental adn Development (IIED) London.

Subsequently formed an institution called Cidanu Watershed Communication Forum (Forum Komunikasi DAS Cidanau; FKDC) was consisting of various components of government institutions, users of environmental services (PT KTI), NGOs, experts, and the community. This institute was established for the purpose of conserving and managing Cidanau watershed with one management principle. Implementation is realized in the concept of integrated management, in order to maintain the quantity, quality and sustainability of development in the western region of Banten, especially to meet clean water needs of people and industries located in Cilegon and surrounding areas.

The upstream - downstream relationship model through PES requires reciprocity between environmental service providers living in the upstream watershed and the use of environmental services in the downstream watershed. Compensation for the environment-preserving community (forest farmer groups) is the cash flow of funds from parties that utilize environmental services (PT KTI), especially water services. Based on the agreement that has been signed, PT KTI does not pay directly to forest
farmer groups, but through FKDC as an intermediary that manages environmental services in this area. Furthermore, FKDC pays environmental services to forest farmer groups after going through certain requirements.

The negotiation process between FKDC and KTI for PES programs resulted in several agreements. The results of this agreement are poured into the Memorandum of Understanding (MoU) signed by the Governor of Banten as Chair of the FKDC with the President Director of KTI.

The contents of the MoU are: (1) PT KTI voluntary agreement to pay environmental services of IDR 3,500,000 per hectare per year with a forest area of 50 hectares or IDR 175,000,000 the amount will be paid PT KTI in the first and second year; (2) Manuscript of Understanding and the Payment for Environmental Services Agreement between FKDC and PT KTI is valid for 5 (five) years or up to 2009; (3) Total payments for KTI’s environmental services for 3rd to 5th years are based on the results of negotiations between FKDC and PT KTI (renegotiation).

In implementing the PES program in the Cidana watershed, the FKDC formed an Ad Hoc Team based on the decision of the Daily Chief Executive of FKDC. The main task of the Ad Hoc Team is to manage PES funds and form the Cidanau Environmental Services Management Agency. In the management carried out by Ad Hoc Team: are: (1) the realization of the buyer’s environmental reward is based on requirement demanded by buyer, including rights and obligations of the buyer, (2) schedule of realization of the yield by the buyer, and (3) other matters relating to the accountability and transparency of management conducted by Ad Hoc Team.

Meanwhile, the payment of environmental services that conducted by Ad Hoc Team to public is based on agreements relating to the amount of payments to be received by sellers, payment receipt schedule, and other requirements to be met by sellers. The core of agreement, among others: (1) PES to be received by Farmers Group (sellers) of IDR 1,200,000 per hectare per year; (2) The environmental service fee agreement shall be valid for five years, starting from the date of the contract; (3) Return of the environmental services will be received in three payments with percentage of payment, as follows: (a) 30% will be received by sellers at the signing of agreement, (b) 30% will be received by sellers after six months from the date of signing agreement, (c) 40% will be received by seller after twelve months from the date of signing agreement; (4) The number of crops, for both fruits and timber species, are not less than 500 stems at the end of fifth year (during the contract period).

The concept of downstream-upstream payments was through the PES program, schematically is shown in Figure 2.

![Figure 2. PES Scheme in Cidanau Watershed.](source: Modified from Lapeyre et al (2015) ; Amaruzaman et al (2016))
The potential buyer of ecosystem services (ES) in Cidanau watershed was relatively easy to identified, as PT KTI manage most of the commercial water supply from Cidanau. In 2004, FKDC approached KTI to joined PES scheme. Negotiation was carried out through serial meetings to raise awareness and to understand PES, combined with a field visit to saw the real condition of farmers and upstream watershed [14]. After a year of intensive negotiation, FKDC succeed in promoting a tripartite agreement between (1) KTI as buyer beneficiaries of Cidanau watershed services; (2) FKDC, as intermediator, and representative from all related elements (Banten Province, Serang and Pandeglang District Governments, KTI, NGO Rekonviasi Bhumi, and local farmers), and (3) the farmer group, as sellers of watershed services [16]

At 2015, two farmer groups had been committed to join PES. In the same year, the agreement was reached between all parties namely the farmer group (karya Muda II and Maju Bersama) as buyer and FKDC as intermediator which is signe by signing cooperation contract document for implementation PES. Then in 2008, two more farmer groups agreed to follow PES program, there were Alam Lestari and Agung Lestari. In the middle way of program, two groups were dropped out (Maju Bersama and Agung Lestari) and the others (Karya Muda II and Alam Lestari) still survive until now (see Table 1).

| No. | Farmer Group     | Sub district | Members (Persons) | Area (Ha) | Contract Duration | Status |
|-----|------------------|--------------|-------------------|----------|-------------------|--------|
| 1.  | Karya Muda II    | Ciomas       | 43                | 25       | 2005-2010         | 1st contract |
| 2.  | Maju Bersama     | Padarincang  | 34                | 25       | 2005-2008         | drop out    |
| 3.  | Alam Lestari     | Mandalawangi | 60                | 25       | 2008-2013         | 1st contract |
| 4.  | Agung Lestari    | Gunungsari   | 30                | 25       | 2008-2009         | drop out    |
| 5.  | Karya Muda II    | Ciomas       | 36                | 26       | 2010-2015         | 2nd contract |
| 6.  | Karya Muda III   | Ciomas       | 61                | 25       | 2010-2015         | 1st contract |
| 7.  | Harapan Maju     | Mandalawangi | 77                | 27       | 2011-2016         | 1st contract |
| 8.  | Karya Bhakti     | Ciomas       | 36                | 26       | 2011-2016         | 1st contract |
| 9.  | Alam Sejahtera   | Mandalawangi | 58                | 25       | 2015-2019         | 1st contract |
| 10. | Alam Lestari     | Padarincang  | 58                | 25       | 2016-2019         | 1st contract |
| 11. | Barokah          | Padarincang  | 25                | 25       | 2015-2019         | 1st contract |
| 12. | Gosali Indah     | Padarincang  | 25                | 25       | 2015-2019         | 1st contract |
| 13. | Cibunar          | Cisitu       | 25                | 25       | 2015-2019         | 1st contract |
| 14. | Harapan Jaya     | Ciomas       | 53                | 25       | 2015-2019         | 1st contract |
| 15. | Sinar Harapan II | Mandalawangi | 26                | 25       | 2015-2019         | 1st contract |
| 16. | Karya Muda II    | Ciomas       | 43                | 25       | 2015-2019         | 3rd contract |
| 17. | Karya Muda III   | Ciomas       | 25                | 25       | 2016-2020         | 2nd contract |
| 18. | Harapan Maju     | Mandalawangi | 25                | 25       | 2016-2020         | 2nd contract |
| 19. | Karya Bhakti     | Ciomas       | 25                | 25       | 2016-2020         | 2nd contract |
| 20. | Alam Sejahtera   | Mandalawangi | 25                | 25       | 2016-2020         | 2nd contract |

Source: Modified from Amaruzaman et al (2016)

The beginning period of implementaion PES program is a critical period whther this PES will succeed or fail. The two groups that dropped out, can be concluded that farmers as a member of groups had not fully understood the benefits of PES, especially for their life and sustainability of environmental resources. In the peasant group that dropped out due to the relatively high economic status with more than 1 hectare of land ownership, members considered the money obtained from the sale of environmental services was too small. In addition, there is still a free nature of farmers on their land they have not fully understood that cutting down trees on existing land under contracts will thwart the
contracts in groups. Karya Muda II Group is a group of farmers who consistently continuing to run the PES program and is considered successful entering a third tranche contract value (IDR 1,750,000.00). The success of Karya Muda II has encouraged other farmers to participate in PES program. It is proven that there are four groups to followed PES in 2010 and 2011. Since then, many of farmer groups have submitted proposals for PES program. By reason of limited financial of buyer, only selected proposals that approved through the selection. The selection used Participatory Landscape Appraisal (PaLA) method developed by ICRAF.

4.2. PES Scheme in Cidanau Watershed: The Role of Communities

Starting from the concerns of watershed conditions at that time that experienced has environmental degradation. Whereas in the watershed there is a natural reserve “Rawa Dano” must be protected from destruction. Environmental problems that occur in this watershed include: (1) encroachment of forests on the slopes to be used as agricultural land [15]; (2) floods, drought, and erosion as a result of open agricultural farming systems (cultivating systems); (3) sedimentation causing silting “Rawa Dano” so that the water storage capacity is reduced. The eroded soil contributes to the high erosion and sedimentation rates of 71,000 ton/year and 75.7 cm/year respectively [16]. These problems are caused by the increased of population pressures in line with increasing population in watershed area. Population characteristics in region, such as high population rates (more than 3%), low level education, basic livelihoods as farmers with narrow land holdings (less than 1 hectare), and low income levels. The farming community resides in upstream area of the catchment area. With this society’s condition, it often become accusation as environment destroyer. Therefore, if these environmental problems are being kept, the damage to the environment will get worse.

At first, socialize PES program is really difficult and there are so many obstacles from peasant community it self. Farmers are reluctant to include land in this PES program. According to research sources, this is due to traumatic feelings in past, farmers were afraid of losing their cultivated land. For that needed a proper approach to farmers, namely by using approach of human development, business development, and community development. The methods were Participatory Rural Appraisal (PRA), Own Village Survey, and Adult Education [14].

The PRA method was intended to encourage rural communities to participate in improving and analyzing village knowledge about their lives and conditions in order to plan and implement the plan. Activities undertaken in an effort to strengthen community institutions that conducted by providers to made regular groups and discussed issues related to the implementation of PES. Regular group-level meetings are a means by which members communicate things between them. The meeting discussed issues, related to the optimization of land use, the necessary training to increase resources, and support the cultivation and economic activities based on their availability and capacity. In addition, this meeting is a tool for the transformation of information, knowledge, insight, and applied technology that impact on the occurrence of social change and strengthening social institutions. From the regular meeting will also formed knowledge, attitude, behaviour, and commitment among groups and members to maintain always the function of forests in supporting the sustainability of their lives within the framework of conservation of watershed resources and environmental services it produces.

Implementation of PES in the Cidanau watershed has entering third period until present. The first period is done between 2005 and 2009, the second period in 2010 to 2014 (signed on June 17, 2010), and the third period 2015 to 2019. Target achievement land cover through this program is 150 hectares in 2014 and more than doubled covering 300 hectares by 2019. The target is relatively small compared to the critical land area (4,300 hectares) in the Cidanau watershed. Seeing the success of the farmers who followed the PES program has encouraged other farmers who are members of farmer groups to participate in this program. It proved to be a lot of groups of farmers who enroll for the PES program in the middle of the limitations of existing funds. For the third period PES participants were selected through a competition.
On July 10 to 12, 2014 along with NGO’s Rebhumi and ICRAF collaboration with FKDC conduct an open auction experimental environmental services. Before the auction held the prospective bidders training using the Participatory Landscape Appraisal (PaLA) approach, the farmer groups were elected as participants of the PES. This refers to the opinion of Ha, et al (2011) PaLA was designed as an option to combine multi-stakeholders knowledge and perspectives for the development of sustainable land use from plot to farm and community level, mainly to be used in the upland context [16]. With an interdisciplinary and system approach in mind, the author brought both biophysical and socio-economic aspects into the method. The objectives of PaLA are: (17)

1) To articulate and study farmers’ perception of the relationship between land use and landscape functioning.
2) To understand farmers’ management options and actual choices made.
3) To understand the flows of water, sediment, nutrients and organisms and internal filter functions that determine landscape functioning the basis of the mosaic of land use practices and interactions between landscape units.

In the implementation of the PES program in the Cidanau watershed, there are four parties involved: farmers, PT. KTI, FKDC, and the Government. Each side has a role in determining the success of PES program. Farmers as owner, who live in upstream watersheds, has a role to preserve and conserve watershed resources, especially forests. Farmers who join the farmer's group voluntarily include land to follow the agreed PES scheme. Farmers planting their land, which was planted by their rules, should grow crops with PES schemes by planting tree or annual crops (forest trees or fruits). Based on the agreement, the proportion is 30% forest and 70% fruit crops.

PT. KTI is a company authorized to process Cidanau river water into clean water. The processing results are then distributed around, more than 120 industries in the city of Cilegon. In addition, PT. KTI also distributes clean water to the public through PDAM (Perusahaan Daerah drinking water). Recognizing the importance of the Cidanau River as the main source of clean water, PT. KTI is trying to maintain the river water flow so as not to be too volatile. Through the initiation of NGO Rekonvasi Bhumi, PT. KTI is willing to build a PES program in the Cidanau watershed. The consequences of PES program development are PT. KTI is willing to pay farmers in upstream watersheds that have preserved and conserved the forest that functions as a recharge area.

Banten Provincial Government acts as a policy maker in the management and conservation of the environment. The Government of Banten Province welcomed PES Program by issuing Decree No. 123.4 / Kep.64-Huk / 2002 signed by former Governor of Banten, H. D. Munandar.

Cidanau Watershed Communication Forum (FKDC) is an independent and open institution in the management and utilization of Cidanau watershed through PES Program. In its organizational structure, FKDC consists of elements of government, PT. KTI, farmers, and NGOs. FKDC has several roles (1) developing of integrated management of Cidanau Watershed based on the concept of one watershed, one integrated plant, and one integrated management; (2) improving the quality of community life in Cidanau watershed; (3) solve problems in the Cidanau watershed through facilitation, coordination and advocacy efforts; and (4) broadly market the environmental services of the Cidanau Watershed and establish an environmental service management agency. The main task of FKDC is to regulate and establish the general policy on the management of environmental services in the Cidanau watershed and to develop and define technical guidelines for the management of environmental services.

4.3 Benefits
4.3.1 PT KTI (Buyer)

More than ten years of PES implementation in Cidanau watershed have a positive impact for all parties involved, either directly or indirectly. The benefits are felt by PT KTI as buyers at the moment is the supply of raw water sources are relatively stable in every season, so as to guarantee the sustainable production of clean water. Before the PES implemented Cidanau river flow is very volatile, very
abundant in the rainy season and vice versa debit fell sharply in the dry season. Fluctuating flow rate conditions, it is often very difficult for the company, namely the difficulty of supply of raw water source in the dry season. In the rainy season but the supply is abundant silt level in the raw water is very high, this causes the production costs in the water purification process will increase. Based on the results of interviews, it can concluded that (1) if the watershed environment is not given treatment for conservation, there will be a decrease of flow rate in the coming year; and (2) increasing current flow discharges is difficult to achieve, attempts to maintain flow discharge so as not to extreme fluctuations are seen as a skill.

| Table 2. Average Debit of Cidanau River (2007 – 2014) in litters/sec |
|---------------------------------------------------------------|
| **Years**<br>2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
| **Month**<br>Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| 14.620 | 5.062 | 6.284 | 5.259 | 5.259 | 4.051 | 6.284 | 5.259 | 4.051 | 6.284 | 5.259 | 4.051 | 6.284 |
| 22.214 | 32.145 | 26.116 | 16.366 | 12.644 | 11.762 | 7.284 | 3.207 | 2.813 | 3.820 | 2.813 | 2.813 | 2.813 |
| 3.845 | 11.025 | 16.983 | 10.033 | 5.935 | 1.945 | 1.160 | 1.507 | 1.945 | 1.160 | 1.507 | 1.945 | 1.160 |
| 2018 | 11.114 | 15.140 | 13.105 | 8.855 | 3.882 | 2.139 | 1.365 | 1.755 | 1.365 | 1.755 | 1.365 | 1.755 |
| 2019 | 13.063 | 13.859 | 3.902 | 3.132 | 3.064 | 3.333 | 3.064 | 3.132 | 3.064 | 3.333 | 3.064 | 3.132 |
| 2020 | 17.529 | 4.357 | 7.744 | 7.185 | 8.462 | 10.842 | 17.353 | 21.822 | 14.206 | 5.423 | 14.206 | 5.423 |
| 2021 | 14.827 | 12.382 | 25.141 | 19.345 | 10.749 | 6.164 | 2.849 | 1.501 | 1.620 | 3.110 | 3.406 | 7.281 |
| 2022 | 15.958 | 16.514 | 9.692 | 17.261 | 4.622 | 2.957 | nd | nd | nd | nd | 2.491 | nd |
| 2023 | 19.055 | 14.763 | 8.178 | 13.183 | 12.575 | 7.234 | 11.136 | 8.497 | 3.882 | 2.396 | 7.013 | 14.870 |
| 2024 | 14.030 | 11.185 | 8.656 | 10.324 | 5.765 | 5.593 | 8.536 | 4.065 | 2.220 | 1.946 | 5.997 | 13.058 |
| 2025 | 17.414 | 11.185 | 8.512 | 7.972 | 7.972 | 7.424 | 1.704 | 1.568 | 1.419 | 1.390 | 2.026 | 13.136 |

nd = no data; AWLR is damage

Source: Head Office PT KTI, 2016.

4.3.2 Farmers (Sellers)

For the farmers who inhabit the upper reaches of the Cidanau watershed after PES program accepted many benefits. In addition to obtaining cash paid on a regular basis, also benefit follow-up of replanting in their property, namely in the form of tree that are non-wood can be utilized. The requirement of Payment for Environmental Service (PES) in Cidanau watershed is that the number of stand exist and grow well should not be less than 500 (five hundred) stands per hectare until the contract period expires (Khairiah, et.al, 2016).

The benefits for farmers from this PES program are direct and indirect benefits. The immediate profit is cash payment of IDR 1.2 million to IDR 1.75 million per hectare per year. Indirect benefits are obtained through the sale of plant products (fruits and others) and the availability of water sources for domestic needs. For the simulation, Mr. Bahroni of Farmers Group of Karya Muda II in Citaman Village has 0.2 hectares (2000 square meters) that is included in the PES program. Every year the farmers harvest three times of melinjo (Gnetum gnemon) with an average yield of 0.7 tons per harvest. If every kilogram of raw melinjo (Gnetum gnemon) sold at IDR 13,000, it will earn approximately IDR 7,000,000. In addition, every two weeks pluck dozens of kilograms of melinjo (Gnetum gnemon) leaf with an average selling price of IDR 5,000 per kilogram. In the harvest session of durian (Durio zibethinus) and petai (Parkia speciosa), earn additional revenue from the sale of sizable durian (Durio zibethinus) and petai (Parkia speciosa). The same condition is also felt by other farmers PES participants. Thus, payments for PES programs have improved incomes for people who are generally poor farmers with land holdings of less than one hectare. The most perceived benefits for the community, especially the Ciomas, is the availability of clean water flowing from the slopes of Mount Karang.

5. Conclusion and Recommendation

PES program is a relatively new instrument in the management of natural resources. In the implementation of PES has involved all stakeholders for a goal that is the achievement of sustainable use of environmental services. The implementation of PES in the Cidanau watershed has involved several stakeholders, are: (1) the farmer community were that inhabit the upstream Cidanau watershed who are to preserve the nature, especially forests or other stand-up crops. (2) The downstream Cidanau watershed
community who are utilizing the environmental services were to participate by providing funds to support the sustainability of the environmental services. (3) The Rekonvasi Bhumi (NGO) acts as a bridge between two upstream and downstream interests of the Cidanau Watershed. (4) FKDC which acts as a liaison and manager of PES activities, and the local government (provincial and district governments) are expected to support and create rules so the program becomes legal. Many challenges and obstacles are arise, both from upstream watershed communities as sellers or from buyers, and even from the local government itself. Thanks to the hard work of all parties, then the problems faced solved well. The success of several farmer groups has encouraged other farmers to join the PES program.

Implementation of PES in Cidanau watershed also expected to be a motivation for similar programs in other areas. When this PES have been carried out widespread, expect apart objects and environmental services can be used on an ongoing basis, it can also lead to a mutually beneficial synergistic relationship between watershed communities downstream and upstream sections of society. Thus, it can help to reduce poverty, or at least can rise up of income communities in upstream watershed.

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