

# PAYMENT FOR ENVIRONMENTAL SERVICE TOWARD SUSTAINABLE RIVER BASIN MANAGEMENT

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## ABSTRACT

*In Indonesia, there are 89 river basins and 59 of these river basins were in critical condition in 1998 (Dirjen Penataan Ruang, 2003). Now, the number of critical river basins in Indonesia could increase due to deforestation, uncontrolled-illegal logging and over exploitation of natural resources. This condition gives negative impacts such as flood and landslide in many regions. There are some efforts could be done to minimize flood and landslide such as implementing integrated river basin management involving all stakeholders and using multi-discipliner approach. Integrated river basin management is a time consuming activity and costly. Payment for environmental services (PES) is a funding model implemented regarding to river basin management that involves all stakeholder in upstream and downstream areas of a river basin. This paper is abstracted from literature study based on some resources. According to this literature study, it is reported that PES has been implemented in some countries such as USA, Costa Rica, Australia, Philippines, and France. In Indonesia, an example model of PES is implemented in Bengawan Solo River Basin and Kali Brantas River Basin, and the program is called as Role Sharing Program. This role sharing program is important, and should be implemented in all river basins in Indonesia to ensure the sustainability of the river basins.*

Keywords: *integrated river basin management, payment for environmental services, role sharing*

## INTRODUCTION

Indonesia is a tropical country which has 2 season, i.e., wet season and dry season. During wet season, it is generally known that many regions get flooded. On the other hand, in dry season many regions get drought. Both of these conditions give negative impacts. A flood gives negative impact for human, infrastructures, agriculture, livestock, etc. Drought also gives some negative impacts for human as well as infrastructures. Along with rapid population growth and development, besides flood and drought, there have been some significant problems in many river basins in Indonesia, such as deforestation, erosion, sedimentation and biodiversity degradation. These serious problems should be solved as soon as possible to sustain the river basin and its environment. The action to sustain a river basin and its environment is a time consuming activity, involving many stakeholders, requiring multi-disciplinary approach, and costly. However, it will give some benefits for the existing generation as well as the future generation. The upstream region and downstream region is interdependent, because the activities done in the upstream region will give impact to the downstream region. For example, the impact of mountain ecosystem degradation through clear-cutting and unsustainable forestry and agricultural practices can be tremendous and costly downstream. Impacts include shallower aquifers and

wells, siltation of hydropower and irrigation reservoirs through hillside erosion, less water retention in the dry season, and more violent floods in the rainy season. Therefore, cooperation between upstream and downstream regions to manage the river basin is extremely required. Some countries such as Costa Rica, Philippine, USA, Australia, Colombia, Ecuador, and France have implemented an incentive-based mechanism (involving stakeholders in upstream and downstream area) in managing their river basins and its environment.

## TYPICAL PROBLEMS IN RIVER BASIN IN INDONESIA

There are 89 river basins in Indonesia. There was a report that in 1992, there were 39 river basins in critical condition in Indonesia, and it increased become 59 river basins in 1998 (Dirjen Penataan Ruang, 2003). In Java Island alone, there are 22 river basins, and most of these river basins are in critical condition (20 river basins). There are typical problems in the regions located on these critical river basins, i.e. get flooded during wet season, get drought during dry season, high erosion and sedimentation rate, and landslide problem. This condition gives negative impacts such as siltation of hydropower and irrigation reservoirs through hillside erosion, for example in PB Sudirman Dam (Mrica Dam). Due to unsustainable agricultural practices

done by potato farmers in Dieng Hill that increased erosion and sedimentation rate, the hydropower infrastructures in PB Sudirman Dam have stopped operating.

In addition, in 2002 there were flood and landslide disasters happened in many regions in Java Island such as Jakarta, Ciamis, Subang, Bogor, Karawang, Majalengka (West Java); Tangerang (Banten); Brebes, Pemalang, Kendal, Semarang, Kebumen, Cilacap, Pati, Kudus (Central Java); and Lumajang, Banyuwangi, Bojonegoro, Pacitas, Tulungagung, Trenggalek, Surabaya, Malang, Situbondo (East Java) (DirJen Penataan Ruang, 2003). Flood disaster also happened in Sumatera Island, for example flash flood in Bahorok. Recently, Kompas (2006) reported that 6 regencies in Nanggroe Aceh Darussalam Province got flooded on 23 December 2006. These problems were not only caused by climate condition but also caused by man-made activities such as clear-cutting activities and unsustainable river basin management.

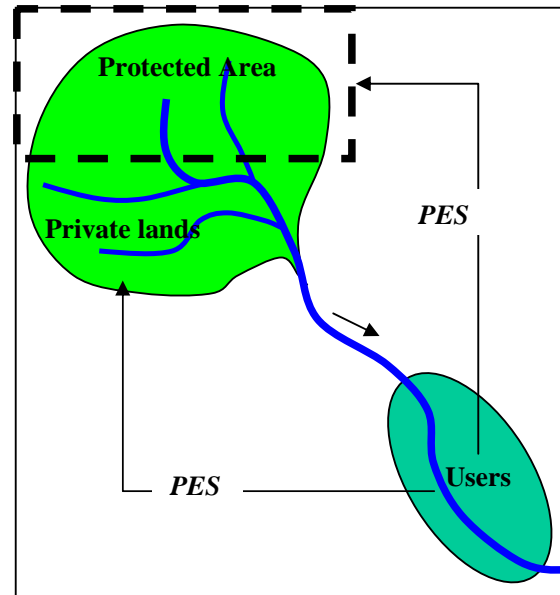


Figure 1. An Illustration of Payment for Environmental Services Schemes (cited from Pagiola and Platais, 2005)

## PAYMENT FOR ENVIRONMENTAL SERVICES (PES)

### Water Services

According to Pagiola and Platais (2005), water services can be distinguished as :

- **Supply of services.** From this point of view, upstream land uses will affect the quantity, quality and timing of water flows.
- **Demand for services.** From this point of view, there are some possible downstream beneficiaries such as : domestic water use, irrigated agriculture, hydro-electric power, fisheries, recreation, and downstream ecosystem.

### The Principles of PES

According to Pagiola and Platais (2005), there are 2 principles in PES, that is :

- Those who provide environmental services get paid for doing so (“provider gets”)
- Those who benefit from environmental services pay for their provision (“user pays”)

Payments can go to private landowners or protected area budget. Figure 1 below shows an example illustration explaining the scheme of PES.

In addition, according to Koch-Weser (2002), one promising instrument for downstream-upstream cooperation is payments for environmental services (PES). Water users compensate the river basin’s upstream forest owners and land holders for, for example, forest conservation or reforestation or other services to maintain or improve water quantity and quality downstream. By giving an economic value to the environmental services provided by, for instance, the maintenance of forests, ecosystem protection can become an attractive alternative to other land uses pursued by the forest owners.

Furthermore, Koch-Weser (2002) reported that payments for environmental services require elements especially:

- valuation of the environmental services, from the vantage point of one or several stakeholder groups downstream;
- social organization effective enough among the respective upstream and downstream negotiating parties to allow for tangible payment agreements;
- clear and verifiable agreement on targets, and related implementation and monitoring arrangements;
- a legal and institutional framework;
- provisions for conflict resolution.

## **DIRECT PAYMENT FOR ENVIRONMENTAL SERVICES IN RIVER BASIN MANAGEMENT**

### **Valuing Ecosystems Services**

According to Van Halsema (2005), within the realm of river basin management, PES is being established around a set of generally acknowledged water related ecosystem services. As a rule these are related to the positive impact of specific types of land-cover or land-use on the hydrological state of the river basin – with specific emphasis on forests. Potential beneficial services emphasized are then:

- improvement of water flow, especially stabilization and increase of dry season flows;
- soil conservation and minimization of sedimentation;
- reduction of agricultural source pollution;
- improvement of microbial water quality.

Furthermore, Van Halsema (2005) reported that within river basin management the basic premise of PES is the upstream-downstream hydrological dependency. Where upstream ecosystem service providers can provide hydrological benefits to downstream water users.

Specific arrangements are then negotiated and agreed between upstream service providers and downstream users, as part of the establishment of the PES fund, or mechanism. Wherein the principle issue is to determine what type of activities or land uses will constitute hydrological or ecosystem services that will be eligible to receive compensation, and how much financial resources the users are willing to contribute to the fund.

### **Legal and Contractual Aspects**

In addition, Van Halsema (2005) reported that one of the core issues is the organization of the PES-fund, which will take the institutional responsibility to manage the fund, in terms of the user contributions and the compensation payments and their contractual arrangements. The presence of a PES specific legislation is generally not a prerequisite for PES-funds to register or operate effectively. But rather, it is found that they could adequately register and operate under existing legislation. That is, as long as a fund can be registered under corporate status and can operate under the general judicial system as a contracting party. In some cases it has been found that PES schemes have been brought under public agencies, which coincided with higher administration and transaction costs, and thus less effective compensation mechanisms. In general there is thus a clear preference to set-up the PES fund as an autonomous legal entity, with representation or

stewardship of both service providers and service users.

According to Van Halsema (2005), contractual arrangements with users vary largely in both height and contract duration, and form part of the specific negotiation and agreement outcomes in the specific context. Two general types of contracts can be discerned however: i) contribution of a fixed percentage of revenue of the users (usually applied by participating utilities), and ii) contribution of a fixed annual contribution (seemingly favoured by industry). In general the arrangements seek to establish mid to long term agreements, i.e. from 20 up to 80 years, in order to secure the viability and sustainability of PES scheme through commitment of the users. Especially in those cases where the conversion to environmental practices plays an important role, a midterm perspective is required to allow the benefits of the ecosystem services to actually take effect.

Furthermore, Van Halsema (2005) reported that the contractual arrangements with the service providers can take two very different forms. A common and most direct arrangement is to provide a specified financial compensation for a specified type of land-use (\$/ha/year). The contractual arrangement is then usually made for a short to mid-term period and conditional to the compliance of the provider to the terms (i.e. type of land use) of the agreement. Another general form encountered, is that the PES is setup as a trust or investment/development fund for ecosystem services. Contrary to the former, these types of PES-funds do not enter into direct compensation agreements. Instead, the financial resources may be used to directly purchase land in the river basin, or invest in the adoption of environmental friendlier technologies and techniques.

In addition, Van Halsema (2005) reported that the first type of direct compensation agreements requires the PES scheme to make transactions in the payment of compensations, as well as in monitoring the compliance. These can constitute substantial transaction costs in relation to the total available compensation funds. Generally these tasks are outsourced to an intermediary. When in place and effective, existing institutions as water user associations or other regulation of management institutions active in the area of the service providers may take up this role.

## **EXPERIENCES FROM OTHER COUNTRIES**

Koch-Weser (2002) reported that there have been some experiences from some countries related

to the implementation of payment for environmental services (PES) as can be seen on Table 1 below.

The cases on Table 1 can be described as follows :

- Case 1 : Australia (Irrigators Finance Upstream Reforestation)
- Case 2 : Colombia (Irrigators Pay Upstream Landowners for Improvement of Stream Flow)
- Case 3 : Costa Rica (Hydroelectric Companies Pay Upstream Landowners via FONAFIFO)
- Case 4 : Ecuador (Watershed Conservation Fund for Quito)
- Case 5 : France (Perrier Vittel's Payments for Water Quality)
- Case 6 : Philippines (Makiling Forest Reserve)
- Case 7 : USA (New York City Pays Upstream Farmers for Protecting Its Drinking Water)
- Case 8 : USA (Payments to Farmers for The Retirement of Sensitive Land)

#### **BENGAWAN SOLO AND KALI BRANTAS RIVER BASINS ROLE SHARING PROGRAM**

Sega Arga Tama Consultant (2006) reported that role sharing program implemented in Bengawan Solo and Kali Brantas River Basins would involve stakeholders such as PT. PLN, PDAM, Department of Forestry, PT. Jasa Tirta, and the community living in the upstream area of the river basin. In this case, the institutions that give funding are PT. PLN, PDAM, PT. Jasa Tirta and Department of Forestry. The irrigation water user association does not give fund in this case, because the farmers that use water for irrigation is mostly poor. The receiver of the funding is the community living in the upstream area of Bengawan Solo and Kali Brantas River Basin. Usually, the community living in the upstream area of river basin is poor, and most of them are farmer.

In this program, the amount and the mechanism of funding were set up during public consultation meeting attended by all stakeholders involved. The funding received by the community living in upstream area should be used for supporting integrated river basin management, such as for forestation, land conservation and water conservation. This program has just begun and the result has not been seen yet. However, this program is a good effort toward sustainable river basin, and hopefully could minimize the problems related with land and water, such as erosion and sedimentation rate in Bengawan Solo and Kali Brantas River Basin.

In addition, according to JICA (2006), Perum Jasa Tirta I also has implemented a win-win solution program related to land conservation in the upstream area of Wonogiri Dam. This program has been

carried out by Perum Jasa Tirta I, an NGO, and the community living around Wonogiri Dam. The program objectives are supporting the government to reduce poverty, reducing erosion rate in the upstream area of the dam, and sustaining Wonogiri Dam by reducing sedimentation rate in the dam.

#### **DISCUSSION**

##### **Is PES Appropriate to be Implemented in Indonesia?**

PES implemented in the other countries explained above may be able to be implemented in Indonesia. However, it can not be similarly implemented, because every country in the world is specific and has its own characteristics, such as geographic, social, and cultural characteristic. Before implementing PES, a study and research are required to set the appropriate model of PES. For example, FONAFIFO in Costa Rica is implemented based on study and research carried out in some previous years. However, the implementation of PES in Indonesia should be carried out immediately because there have been problems in some dams due to erosion and sedimentation. The erosion and sedimentation happened in some dams in Indonesia is the impact of the poor river basin management, and need to be solved immediately to sustain the river basin and the water infrastructure located within.

##### **Win-win Solution Mechanism**

A payment for environmental program should be arranged as a win-win solution mechanism. Generally, the community living in the upstream area of river basin is poor, and they get benefit from the natural resources and its environment to support their live. For example, they use wood from the plants growing on the upstream area of river basin as fuel for cooking, and grow some commodity plants such as corn, rice, cassava, and sweet potatoes. In fact, most of the community living in the upstream area of a river basin in Indonesia is uneducated people, therefore they do not have knowledge about land and water management and their activities in preparing the land for agriculture may increase the erosion and sedimentation rate that give bad impact to the water infrastructure located in the river basin. On the other hand, the water infrastructure located in the upstream area of river basin gives some benefits to the community living in the downstream area. For example, the dams supply domestic water to the community downstream, supply water for industrial areas, and supply irrigation water need to the farmer downstream. Based on these facts, PES could be

arranged by involving all stakeholders, i.e. the community living in the upstream area of river basin, PDAM (regional water utility company), industry, related institution such as PT. Jasa Tirta and Dinas Kehutanan, and the association of farmer living in downstream area of river basin. The involvement of the stakeholders is important in order to find a win-win solution mechanism in river basin management.

### **PES and Poverty Reduction**

PES could be a part of poverty reduction program. Perum Jasa Tirta I with an NGO's based in Wonogiri has implemented a program to support poverty reduction and land conservation in the upstream area of Wonogiri Dam. In this program, Perum Jasa Tirta I gave a fund to the community living in the upstream area of Wonogiri Dam with the objective to reduce erosion and sedimentation rate in the dam by doing a land conservation and reforestation. The land conservation and reforestation program has been done by the community with assistance from an NGO's. The fund is given regularly when the plant is growing well. This program is significantly support the government to reduce poverty, and in the long term will give positive impact to the dam as well.

In addition, the Government of Indonesia also carry out a role sharing program in Wonogiri Dam, Bengawan Solo and Kali Brantas River Basins. The role sharing program implemented in Wonogiri Dam, Bengawan Solo and Kali Brantas River Basin is a good initiative, however it requires support from all stakeholders and should be monitored regularly to sustain the program.

## **CONCLUSIONS AND RECOMMENDATIONS**

### **Conclusions**

According to the explanation above, it can be concluded that :

1. Integrated river basin management should involve all stakeholders and use multi-discipliner approach.
2. PES is a funding model involving all stakeholders that can support the implementation of integrated river basin management.
3. PES gives positive impacts such as support the poor community living in upstream area to manage their land and environment. If the upstream area of a river basin is well-managed, it would give positive impacts to downstream area such as minimize flood, landslide, erosion, and sedimentation. Besides sustain the river basin, it would sustain water infrastructure such as dam

and irrigation system as well. Therefore, a win-win solution would be achieved.

4. PES can support the government to reduce poverty in the upstream area of river basin.
5. Although it is time consuming and costly, Bengawan Solo and Kali Brantas River Basins Role Sharing Program is a good effort to sustain the river basin.

### **Recommendations**

The author would like to give several recommendations related to river basin management in Indonesia as follows :

1. The role sharing program should be implemented in all river basins in Indonesia immediately, because most of river basins in Indonesia are in critical condition.
2. Lessons from other countries in implementing PES should be learned to choose what appropriate program could be implemented in Indonesia.
3. Monitoring activity should be done to ensure that the role sharing program is well-implemented.
4. Law enforcement is required in the implementation of integrated river basin management.

### **REFERENCES**

- Dirjen Penataan Ruang Departemen Kimpraswil, 2003. Penataan Ruang Dalam Pencegahan Bencana Banjir : Kasus Pulau Jawa dan Kawasan Jabodetabek – Bopunjur. *a paper presented on Preparation Workshop Toward 3<sup>rd</sup> World Water Forum*, Bali.
- Iin Hatimi H and M. Fuad Bustomi Z, 2004. Role Sharing Pengelolaan Sumber Daya Air Studi Kasus Propinsi Daerah Istimewa Yogyakarta. *a paper presented at PIT HATHI XXI Tahun 2004*, Bali.
- JICA, 2006. *Report of Study on Countermeasure of Erosion and Sedimentation in Wonogiri Dam*. Perum Jasa Tirta I Surakarta.
- Koch-Weser, M.R.B., 2002. Legal, Economic, and Compensation Mechanisms in Support of Sustainable Mountain Development. *a thematic paper presented on Bishkek Global Mountain Summit*.
- Kompas, 2006. *Aceh Dikepung Banjir; 70000 Orang Mengungsi*. Printed edition (24 December 2006), Jakarta.
- Pagiola, S and Platais, G, 2005. Payment for Environmental Services for Dummies. *a presentation for ESSD Weeks 2005 – Learning Days*.

- Perum Jasa Tirta I, 2007. *Personal communication with a staff in Wonogiri Dam.*
- Sega Arga Tama Consultant, 2006. *Diskusi Pekerjaan Role Sharing DAS Bengawan Solo dan DAS Kali Brantas.* Intern discussion, Jakarta.
- Van Halsema, G, 2005. Financial Mechanism for Natural Resources Management : Learning from FAO Experiences. *a paper presented in the Seminar on Environmental Services and Financing for The Protection and Sustainable Use of Ecosystems*, 10 – 11 October 2005, Geneva.

**Table 1. The Other Countries Experience in The Implementation of Payment for Environmental Services (PES)**

	<b>Problems downstream</b>	<b>Nature of the environmental service upstream</b>	<b>Who pays (categories)</b>	<b>Who receives</b>	<b>Involvement of public authorities</b>	<b>Kind of compensation</b>	<b>Legal set-up</b>
<b>Case 1</b>	Soil salinisation	Reforestation	Downstream farmer association	Government agency, private upstream land owners	Major involvement; public agency reforests and sells salinity reduction credits	Yearly payments per ha reforested land for 10 years	Trading scheme
<b>Case 2</b>	Water scarcity, floods, siltation of irrigation channels	Reforestation, erosion control, spring & stream protection	Downstream farmer associations	Government agency, private upstream land owners	Minimal; Agency only designs management plans and distributes the money	Individual contracts	Private deal
<b>Case 3</b>	Siltation of hydro-electric dams, irregular stream flow	Reforestation, sustainable forestry, forest preservation	Hydroelectric companies, government fund	Private upstream land owners	Minimal; provides frame-work for payments, serves as mediator, increases payments	Yearly payments per ha enrolled land for 5 years	Private deal
<b>Case 4</b>	Decreasing water quality & quantity	Patrolling the reserve, change in land use practices	Water users	Fund, private upstream land owners	Major involvement; agency collects fee and undertakes compensation measures	Individual contracts	Public payment scheme, fee
<b>Case 5</b>	Decreasing quality of spring water	Reduction of nutrient runoff and the use of pesticides	Private bottler of mineral water	Upstream farmers	Non-existent	Yearly payments per ha for 18-30 years, pays for new equipment	Private deal
<b>Case 6</b>	Decreasing water quality & quantity		Users of recreation facilities, water users	Fund	University plays a major role		
<b>Case 7</b>	Decreasing quality of drinking water	Implementation of Whole Farm Plans and best management practices	City and water users (tax on water bills)	Upstream farmers	Major involvement; NYC completely finances the program	Covering of additional costs of management change, reduced property tax	Public payment scheme, tax
<b>Case 8</b>	Soil erosion, decreasing water quality	Reforestation, implementation of conservation practices	Government	Farmers	Major involvement; the government completely finances the program	Yearly payments per ha for 10-15 years	Public payment scheme

(cited from Koch-Weser, 2002)