

Developing markets
for watershed
services and
improved livelihoods



Fair deals for watershed services in Indonesia

Munawir
Sonja Vermeulen

*ii*ed *LP3ES*

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Acronyms and abbreviations

BAPPEDA	<i>Badan Perencanaan Pembangunan Daerah</i> (Regional Development Planning Agency)
BIOTROP	South-East Asian Regional Centre for Tropical Biology
DAS	<i>Daerah Aliran Sungai</i> (river catchment)
DFID	Department for International Development (UK government)
EUR	Euro (currency)
FKDC	<i>Forum Komunikasi DAS Cidanau</i> (Cidanau Catchment Communication Forum)
GNRHL	<i>Gerakan Nasional Rehabilitasi Hutan dan Lahan</i> (National Movement to Rehabilitate Forests and Land)
IDR	Rupiah (currency)
IIED	International Institute for Environment and Development
IIUPH	<i>Iuran Zin Usaha Pemanfaatan Hutan</i>
IUPK	<i>Izin Usaha Pemanfaatan Jasa Lingkungan</i>
JICA	Japan International Cooperation Agency
KTI	<i>Krakatau Tirta Industri</i> (Krakatau Water Industry)
LP3ES	<i>Lembaga Penelitian, Pendidikan dan Penerangan Ekonomi Sosial</i> (Institute for Social and Economic Research, Education and Information)
NGO	Non-governmental organisation
PDAM	<i>Perusahaan Daerah Air Minum</i> (District Domestic Water Company)
PES	Payments for environmental services
PJT1	<i>Perusahaan Umum Jasa Tirta 1</i> (Brantas River Basin Operator)
PLN	<i>Perusahaan Listrik Negara</i> (National Electricity Company)
PPTPA	<i>Panitia Pelaksana Tata Pengaturan Air</i> (Basin Management Committee)
PSDH	<i>Provisi Sumber Daya Hutan</i>
RUPE\$	Rewarding the Upland Poor in Asia for Environmental Services They Provide
SPH	<i>Serikat Petani Hulu DAS Brantas</i> (Farmers' Association of the Brantas Upper Reaches)
UNEP	United Nations Environment Programme
WUA	Water User Association
YPP	<i>Yayasan Pengembangan Pedesaan</i> (Rural Development Foundation)

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Photo credits: Rahadian, Rekonvasi Bhumi



Farmers processing melinjo (*Gnetum gnemon*) at Citaman Village, Cidanau. The Citaman farmers' group has invested environmental service payments in machinery for making crackers from these fruits.



Meeting of villagers, intermediaries and officials at Cidanau. Farmers' groups continue to depend on external support to negotiate the terms of environmental service payment schemes.



Signing of agreement between farmers' groups and KTI at Cidanau. The NGO Rekonvasi Bhumi has played a crucial role as a trusted intermediary.

Executive summary

Introduction

Indonesia, like many countries, faces growing problems with water. Depending on the watershed, concerns include floods, low dry season flows, sedimentation, contamination from run-off, and growing demand among competing end-users. Concerned suppliers and users of water at various localities around Indonesia are now experimenting with new approaches for managing watersheds. One new approach is payments for environmental services, in which water users compensate watershed land managers for land management that protects or improves water quality and flows. This report describes action research in Indonesia to take forward local environmental service payment initiatives at two sites, Brantas and Cidanau, and to spread learning more widely among interested people across the country.

Project objectives and outputs

The action research had four linked sets of outputs: (1) *facilitation* of upstream – downstream transactions, with an emphasis on building institutions for managing upstream – downstream transactions; (2) *supporting research* on social issues, hydrology, economics, finance mechanisms and policy, on a demand-driven, participatory basis; (3) a *national learning network* centred on a group of 20 individuals mainly in government and the private sector, active in issues of watershed management and finance; and (4) *documentation and dissemination* of lessons learned from the project nationally, regionally and internationally. The emphasis was on ‘learning by doing’ through implementation and widespread stakeholder involvement rather than on rigorous hypothesis testing.

Sites

Brantas River in East Java, the first site in this project, is 320 km long with a catchment area of 12,000 km². The economic importance of the river led the Indonesian government to set up the parastatal Perusahaan Umum Jasa Tirta 1 (PJT1: Brantas River Basin Operator) to manage and allocate water resources across the catchment, under a principle of ‘one catchment, one management’. Sedimentation of hydropower dams is the primary cause for concern around watershed management at Brantas. The other site, Cidanau River, is also located on Java Island, in Banten Province. It is a much smaller river, but one where stakeholders have initiated an independent environmental service payment system to improve downstream water supplies, led by the primary licensed abstractor, Krakatau Tirta Industri (KTI). As at Brantas, the main concern is sedimentation of watercourses, particularly the channel that supplies industrial and domestic users.

Payment mechanism developed at Brantas

The Brantas River Basin Operator, PJT1, sees upstream land management as an alternative to downstream dredging and cleaning operations in maintaining water supplies for hydroelectricity and other uses. In the past, they have transferred their full conservation budget to district forest offices to undertake tree planting on state and private land, but they have now entered into a pilot payment scheme at Cibagong and Citamon Villages with two groups of small-scale farmers with fields of 0.1 – 0.25 ha¹ in critical upland areas. Under two contracts (signed in 2004 and 2005), PJT1 agrees to provide payments of 54 million rupiah (IDR) (€4680²) over a two year period, with an option for renewal. PJT1 pays these funds through a trusted intermediary organisation, *Yayasan Pengembangan Pedesaan* (YPP, a local non-governmental organisation). The contract obliges YPP to facilitate implementation of the transaction and to submit periodic narrative reports and financial arrangement with photo documentation, including reporting on the growth and survival of the planted trees. PJT1 retains the right to check project sites before contract implementation, conduct monitoring and evaluation, recommend improvements in implementation, and access information on progress. PJT1 makes payments on condition that targets for planting and survival of seedlings and maintenance of terracing are met. So far, all conditions have been met and three payments have been made, in 2004, 2005 and 2006.

Payment mechanism developed at Cidanau

Discussions about the possibility of implementing a local direct payment mechanism to fund maintenance of watershed functions began in the multi-stakeholder *Forum Komunikasi DAS Cidanau* (FKDC, or Cidanau Catchment Communication Forum). The main buyer of services to maintain water quality and quantity at Cidanau is PT KTI, the company that holds the contract to manage water distribution from the Cidanau River to domestic and industrial consumers. KTI is voluntarily paying IDR175,000,000 (€15,160) per year per 50 ha for a two year period (2005-2006) and IDR200,000,000 for the following two years towards maintenance of environmental services in the Cidanau catchment, through a subsidiary of the FKDC, known as the Ad Hoc Team, which acts as an intermediary body and holds contracts with farmers' groups. Each farmers' group receives IDR1.2 million (€104) per 500 trees planted, which at recommended planting densities is IDR1.2 million per hectare. Planting is conducted and controlled by the members of the farmers' group, working towards a five-year target of 50 ha of replanting on critical land (25 ha in each of two villages). Farmers' groups may apply for payment whenever they believe that they have met the target of 500 new plantings, along with the maintenance of previously planted trees. If a farmers' group does not fulfil this minimum requirement, the group is paid less. The

1. 1 hectare (ha) = 104 m².

2. Conversion rate of August 2006: IDR11,545 = €1.

Ad Hoc Team verifies planting and maintenance on behalf of KTI. Payments started in 2005 and will continue until the system is reviewed after five years.

Socioeconomic opportunities, impacts and limits

It is too early to tell whether the pilot payment schemes have made participating farmers better off. The per-hectare levels of compensation do not provide meaningful contributions to local incomes, but have been enough to cover the material costs of tree planting and some labour costs, with a small amount of capital remaining to invest in local business development. Farmers are not convinced that the tree crops that they have planted under the contracts will yield cash returns that are high enough and reliable enough to outweigh investment and opportunity costs. On the other hand, they have welcomed the lump sums of capital that have allowed development of collective investment in enterprises such as goat husbandry, tree nurseries and equipment for production of vegetable crackers.

Environmental opportunities, impacts and limits

At present, the payments are made specifically to undertake planting of trees on farmers' dryland fields. The number of trees and the area under trees are the indicators used to measure achievement of environmental services at both sites. However, current scientific knowledge suggests that the causal link between tree planting and reduction in sedimentation may not be straightforward. Other changes in management of the landscape, particularly in the built environment, are likely to have important impacts on downstream water quality and water flows. These may include building terraces, raised beds and other field engineering works, which are considered a useful add-on to tree planting in reduction of soil erosion. Most farmers indicate that they are reluctant to undertake such measures in their own fields for cost reasons. Farmers' groups have, however, mobilised to protect and enhance local water supplies, including investment in water pipes and even a metering system in one village.

Governance opportunities, impacts and limits

All of the farmers' groups have been reluctant to formalise into legally recognised groups able to hold bank accounts and accept direct payments. Farmers wish to avoid burdens of administrative duties and surveillance, but subsequently remain unable to operate as equals within the framework of environmental service payment schemes. The consequence has been the reliance on financial intermediaries (YPP in Brantas and the Ad Hoc Team in Cidanau), whose roles have gone beyond financial management functions to much more powerful roles as negotiators of interests between buyers and sellers. Contracted land-use interventions and payment levels have mainly been decided by buyers, financial intermediaries and facilitators rather than by sellers of the services (farmers).

Lessons from the process

Payments for environmental services have proven to be an attractive concept to a wide range of stakeholders, including small-scale farmers, executives in large industries, parliamentarians and technical staff in government. Indonesian multi-stakeholder forums on environmental service payments have gone beyond discussion of watershed land management to broader issues of upstream supply and – crucially – management of downstream demand and allocation. In this way environmental service payments have worked to reinvigorate catchment-wide sustainable water management. Within the specific payment mechanisms at the two sites, transaction costs have been high in the early stages. The longevity of the schemes will depend on building trust and synchrony among stakeholders to cut associated costs. A related challenge is scaling up from pilot micro-sites to whole catchments and beyond. At present, higher-level decision makers in government and companies are waiting for proof that the payment schemes work, but it is difficult to demonstrate the positive impacts of small-scale land-use changes on larger-scale water quality and quantity at the scale of the catchment. Expansion of the schemes will require a leap of faith in management, a wider range of sources of finance, and a clear policy mandate from central government.

Conclusions and policy recommendations

At present, all of the key groups of stakeholders have legitimate doubts on the efficacy of environmental service payments. Private-sector water users are unsure about environmental service payment schemes because they already pay water taxes, of which a proportion goes to environmental protection. Farmers fear that payments for environmental services are just another project that will try to force uneconomic tree planting on them and then die out once funding is withdrawn. Government departments are concerned that environmental service payment schemes will either divert their budget allocations and power, or else increase government duties without any extra resources to cover these costs. What all sides need is an opening of policy space that creates the right kinds of conditions for environmental payment schemes to emerge, rather than imposing a pre-set approach to forest land management and payment mechanisms. The most important specific policy recommendation is to develop a national-level mandate, institutional guidelines and a clear legal basis for intermediary financial bodies. This would enable other buyers of watershed services, including government departments, to enter the frame. Also important is development of, and increased publicity about, existing fiscal incentives (tax breaks) for the private sector to invest in conservation.



1 Introduction

1.1 Background and rationale

Issues of watershed management are at the forefront of environmental concerns in Indonesia. According to the Indonesian government's 2005 State of the Environment Report, watershed functions are changing rapidly: the past five years have seen conversion of 54 million hectares (7%) of the total watershed area away from forest land to a variety of other land uses, notably residential. The Indonesian government and public blame the increasing frequency and severity of natural disasters – landslides and floods – on deforestation and land-use change in the watersheds. Today 65 of the country's 400 watershed areas are in critical condition (doubling from 32 in 1992)³. Of these, 17 are in Java, where half of the country's 221 million people live.

As well as the internationally publicised environmental disasters, watershed management (or mismanagement) is also associated with several other critical issues of water quality and quantity, such as dry season flows, pollution of both groundwater and surface water, and sedimentation in hydropower reservoirs and irrigation canals. There is increasing competition for water among various uses, especially between irrigation and domestic consumption, with escalating water charges for domestic consumers.

National policies and budget allocations have had mixed success in addressing watershed management issues. Real innovation – as well as trenchant difficulties – has been far more likely to emerge at local level. In 2001 Indonesia committed to what is perhaps the most ambitious decentralisation exercise ever undertaken by a national government, bypassing the provincial level to devolve considerable powers directly to the archipelago's 349 district (*kabupaten*) and 91 city (*kota*) governments. Many local governments, civil society groups and businesses have taken the opportunity to explore ideas from the international arena – including the notion of payments for environmental services, in which water users compensate watershed land managers for land management that protects or improves water quality and flows. Such schemes are new in Indonesia, but emerging in a variety of environmental contexts (Suyanto *et al.* 2005).

3. Critical land is defined as land that is generally unable to fulfil any of the normal soil functions, including water absorption or the production of even a meagre subsistence crop. Multiple indicators, such as high levels of erosion or presence of *Imperata cylindrica* grass, are used to identify critical land.

This report describes action research in Indonesia to take forward local environmental service payment initiatives at two sites and to spread learning more widely among interested people across the country. The remainder of Section 1 explains the approach of the project, including what is meant by 'action research'. Section 2 explores the national policy context and the two sites in greater detail. Section 3 reports on the progress and challenges during the course of the two-year project. Finally, Section 4 summarises the overarching lessons of the project with some recommendations for policy at national and local levels.

1.2 Development of the project

Between 2001 and 2006, LP3ES (*Lembaga Penelitian, Pendidikan dan Penerangan Ekonomi Sosial*, Institute for Social and Economic Research, Education and Information) coordinated a project entitled *Action-learning to develop and test upstream – downstream transactions for watershed protection services in Indonesia*, one of four country action-learning studies under the international project *Developing markets for watershed protection services and improved livelihoods*, coordinated by the International Institute for Environment and Development (IIED). The Indonesian project was a learning process that involved stakeholders at local and national level. The overall goal of the project was to promote provision of watershed services for downstream water users and for society in general, while improving livelihoods within catchment areas. The more specific objective of the project was to increase the understanding of relevant organisations and individuals to participate in the development of upstream–downstream transaction mechanisms for watershed protection services.

The inception phase of the project (2001–2002) included an overview of key water policy issues in Indonesia and identified three sites for action research, based on suggestions from informants in government and civil society organisations in Indonesia, of locations where some initiative towards environmental service payments had been made. Of about ten sites identified, three were chosen for a preliminary scoping exercise: the Brantas River in East Java Province, the Cidanau River in Banten Province (also on Java Island) and the Segara River in West Nusa Tenggara Province (Lombok Island). The criteria for selection of these three sites were availability of information (socioeconomic and hydrological) and clear willingness among potential downstream buyers of watershed services to consider paying for such services.

A diagnostic study was done for the Segara River site. Some transactions and direct finance for watershed protection and water management were already in place, including contributions by the domestic water company Perusahaan Daerah Air Minum (PDAM) to forest management and compensation for land under PDAM's



The Konto River immediately downstream from Bendosari Village. The Konto is one of the main tributaries of the Brantas River.

water pipe. Fees were also being paid by water user associations, which are legally recognised local institutions with responsibility for managing and allocating water locally. LP3ES then worked with a local non-governmental organisation (NGO), Konsepsi, and other partners to develop a payment scheme from the municipality of Lombok Island's biggest city, Mataram, to upstream land managers in the Dodokan catchment area, south of the Segara River. After initial enthusiasm and success, including a Memorandum of Understanding between PDAM and the Mataram municipality, the negotiation process stalled and LP3ES and Konsepsi withdrew for the meantime.

The implementation phase of the project (2004 – 2006) facilitated development and testing of upstream – downstream transactions at the two Javanese sites, Brantas and Cidanau (pronounced Chid-a-now). The relevance of the two sites is explained below; more detailed site descriptions can be found in Section 2.

Brantas River is the second largest river on Java Island. It is situated in East Java and is 320 km long with a catchment area of 12,000 km². Recognising the economic importance of the river, the Indonesian government set up the parastatal PJT1 to manage and allocate water resources in the Brantas catchment. PJT1 was the first integrated basin management body in Indonesia under the principle of 'one catchment, one management' (it is now replicated by PJT2 in the Citarum River Basin that supplies Jakarta). Working with PJT1 provided a valuable opportunity for the project to interact with national policy, because central government hopes to promote and expand the 'one catchment, one management' principle to other major rivers in Indonesia.

Cidanau River is also located on Java Island, approximately 175 km southwest of the capital city Jakarta. The major use of water from the Cidanau River is for domestic and industrial applications in Cilegon City. Krakatau Tirta Industries (KTI) is licensed to abstract water for industrial and urban water users. KTI's main concern with respect to water quantity and quality is the high levels of siltation downstream, which is blamed on upstream conversion of natural vegetation to agriculture by local communities that include both long-term residents and more recently returned transmigrasi migrants (Yoshino *et al.* 2003). KTI maintains a regular programme of silt clearance, using local labour, but this is an inefficient approach and the company is keen to experiment with improved upstream land management as an alternative to cleaning up water channels downstream.

The implementation phase of the LP3ES project aimed, within two years, to facilitate mechanisms for upstream–downstream transactions at the two sites, to conduct supportive research, to convene a national learning network and to share lessons nationally and internationally (Table 1). To perform the facilitation activities,

Table 1

Outputs of the implementation phase of the project

Output	Description
Facilitation	Upstream–downstream transactions facilitated at two sites with an emphasis on building institutions for managing upstream – downstream transactions, especially at farmer level
Supporting research	Applied research conducted on social issues, hydrology, economics, finance mechanisms and policy, on a demand-driven, participatory basis to contribute to the facilitation and national learning group
National learning network	National learning events and activities centred on a group of 20 individuals mainly in government and the private sector, active in issues of watershed management and finance
Documentation and dissemination	Lessons learned from the project documented and then made available to the national learning network and other appropriate channels for learning nationally, regionally and internationally

LP3ES worked closely with local environment and development NGOs: YPP (*Yayasan Pengembangan Pedesaan*, or the Rural Development Foundation) at Brantas and Rekonvasi Bhumi at Cidanau. Working with local NGOs was part of a broader ‘action research’ approach, explained in the next section.

1.3 Methodology: the action-learning approach

Action learning is based on the notion of learning by doing. In this project, ‘doing’ meant facilitating buyers and sellers of watershed services to come together to implement a formal transaction, whereas ‘learning’ meant supplementing the facilitation with a process of shared questioning and reflection in order to gain insights both to inform future activities and to distil lessons for application elsewhere. Action learning is a common-sense approach, synonymous with other well-established methodologies such as ‘adaptive management’, ‘experiential learning cycles’ and ‘critical reflection’. Some of the main implications of the action-learning approach for this project are outlined briefly below.

Constant active engagement with interested parties

In modern times it is standard to emphasise stakeholder engagement in environment and development projects. To engage thoroughly is extremely time-

consuming. Payments for environmental services are a new and untried concept in Indonesia as in most of the world. It is also complicated, so communication required not just information sharing but explanation and marketing. The national coordinator of this project was the hub of a wide network of project participants, participants in other environmental service payment schemes, and people interested in learning more about payments for environmental services, at local, national and international levels (Figure 1). The project tried to go beyond the identified circles of interest to reach others. Levels of interest were surprisingly high: a seminar for the private sector (Jakarta, 20 January 2005) was over-subscribed even though participants had to pay, and there was an excellent turnout at another seminar designed to reach out to a province where the concept of financing environmental management through payments was still little known (Balikpapan, East Kalimantan, 26 April 2006).

Multiple channels for communication

As well as project reports, LP3ES developed other information outlets for distribution within Indonesia, such as the *Jasa Lingkungan* bulletin on watershed management and finance, translations of relevant international materials into Indonesian, and a website on environmental services (www.jasalingkungan.org). A film about the international IIED-coordinated project on payments for watershed services was translated into Indonesian. Rekonvasi Bhumi made an interactive Microsoft PowerPoint presentation for the Cidanau site. However, the main communication tool was simply talking to people, over and over again.

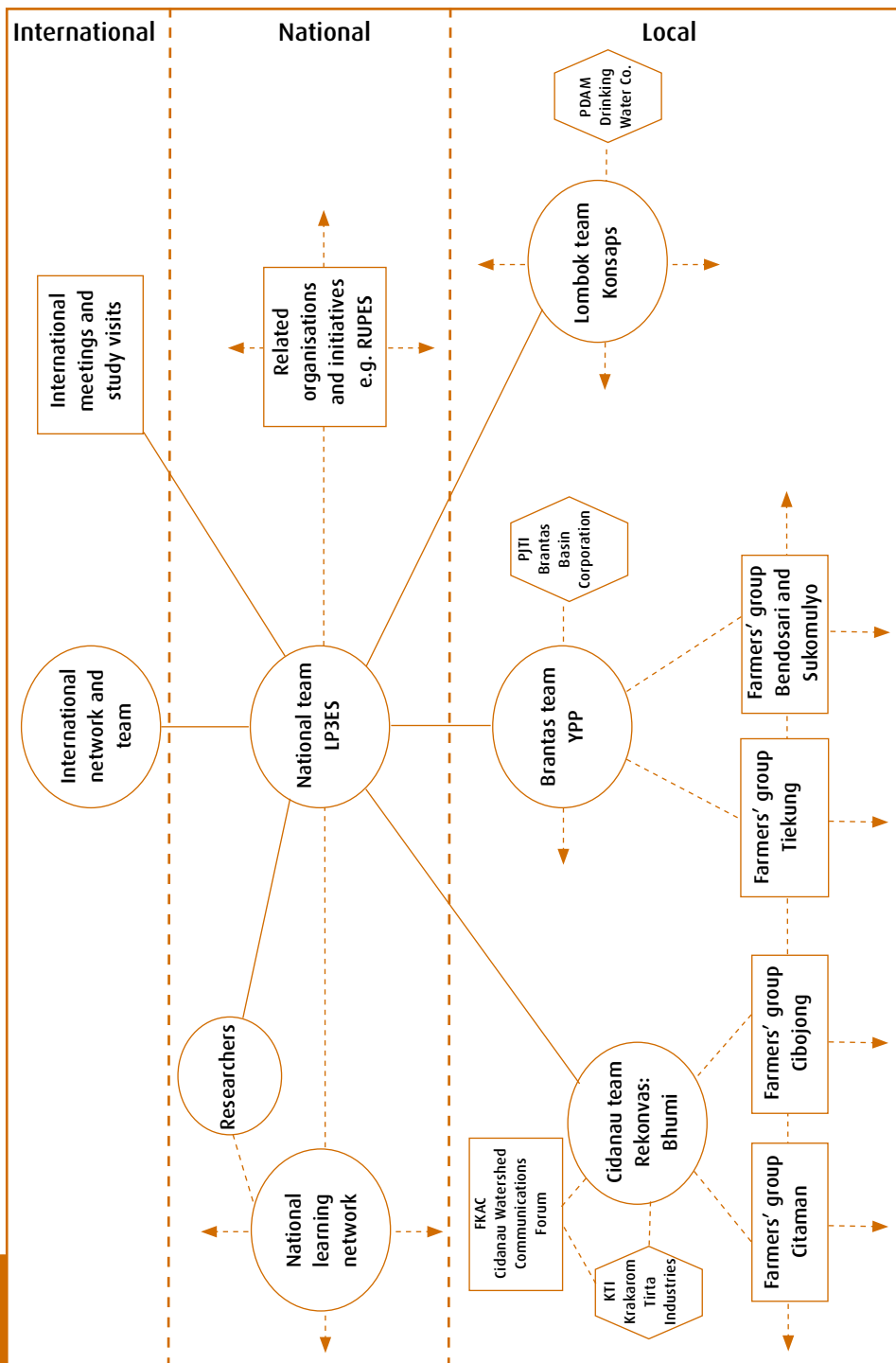
Emphasis on implementation rather than on hypothesis testing

The aim of this project was both to 'develop' and to 'test' payments (or equivalent transactions), both 'action' and 'research'. This threw up a real conundrum: how to facilitate and inspire stakeholders sufficiently so that they implement a transaction, while maintaining a suitably distanced, objective research stance to analyse the outcome? Within the timeframe of the project, the only practicable approach was to put implementation first and let research follow.

Learning for participants rather than for the project

Allied with the principle that the main purpose of research was to support implementation rather than vice versa was an emphasis on research topics led by demand from project participants and in answer to arising problems. For example, LP3ES drew on lessons from the irrigation sector on formal and informal farmers' institutions to advise current development of farmers' groups in Brantas and Cidanau. As far as possible, research actively involved the actual buyers and sellers of watershed services – using self-analysis based on PRA techniques for instance, or

Figure 1



farmer-to-farmer visits to investigate different solutions to land management and finance problems. In practice though, tight integration between 'action' and formal research-based 'learning' was not always achievable, mainly because buyers, sellers and local-level facilitators were too busy, or did not have the skills, to take on the additional burden of research.



2 National and local contexts

2.1 National policy frameworks

Addressing the problems of degradation in upstream areas of watersheds has long been a concern in Indonesian public policy. In the early 1970s, as industrial development intensified, issues of deforestation, erosion and water quality became central to political debate at the highest levels. Whereas immediate economic growth has continued to outweigh long-term sustainability in almost all areas of government policy, opportunities for local innovations and improved incentive schemes for environmental management are opening. Some of the main drivers and trends are discussed below.

Major decentralisation

The most important principle and driving force in Indonesia is the ambitious decentralisation programme set in place in 2001, redistributing responsibility and devolving power from national to district governments (largely bypassing the intermediate provincial level). Indonesia's huge size, geographical dispersion, cultural diversity and preceding 30 year history of one-party centralised government mean that the decentralisation programme has involved – and continues to involve – radical institutional change and uneven trial-and-error progress towards localised governance. Detractors point to the increased opportunities and incentives for plunder of resources under the new system (district governments must largely raise their own budgets; see Hadiz 2004). Proponents on the other hand point to the new space for local accountability and participation in policy (see Aspinall and Fealy 2003 for a range of critiques).

Inter-sectoral integration

A second important principle in Indonesian public policy, promoted since the 1980s, is integration within and across sectors. In 1987 the national government introduced an integrated approach to water management, reflected for instance in the creation of inclusive management bodies for specific river basins, such as PJT1 at Brantas in 1990 (see Section 2.2). The aim was to bring together government departments from environmental management and industrial development sectors, and to draw in the private sector. Government development planning documents, from the Long-range Development Plan (2005 – 2025) to annual workplans, reflect this integration. Unfortunately the reality in most watershed management programmes has continued to be a 'command-control' approach, fragmented

sector-based interventions and general absence of strong enough policy directives to enable widespread uptake.

New water governance

A presidential decree in 1999 set in motion an inter-sectoral process to completely overhaul water governance in Indonesia in the context of decentralisation. The aim was to reform legal, organisational and financing mechanisms and rules in four key areas: overall national policy on water resources management, participation and accountability at all levels, water quality management and irrigation management. The process culminated five years later in Act 7/2004 on Water Resources. Two key principles in the new law are integrated water resources management (based on watershed area boundaries rather than administrative boundaries) and a greater emphasis on conservation, linking water use with water supply. The 2004 Act limits central government to an enabling and regulatory role, responsible for promoting public-private partnerships, transferring resources to district governments, and maintaining guidelines and networks for information exchange, monitoring and regulation. Implementation authority is devolved to district governments and, at the most local level, to water user associations (WUAs), empowered to allocate use rights, set rules and levy fees in irrigation areas. However, the WUAs are not always able to negotiate allocation rights effectively when up against large industrial interests (Kurnia *et al.* 2000).

Forestry's continued emphasis on extraction

Indonesia has also undertaken forest sector reform in the past decade with Act 41/1999 on Forestry. The new law explicitly includes the notion of 'environmental services',⁴ but only as an aspect of forest utilisation and extraction, without any reference to maintenance and upkeep of the services. This bias creates a hurdle to the development of policies to implement environmental services payments in Indonesia, because all subsequent regulations and policy statements take their understanding of environmental services from the 1999 Forestry Act (Box 1). Although the Act emphasises use over conservation, other aspects of forest policy do provide financial mechanisms for conservation and rehabilitation of forests, though these need considerable fine-tuning to embody or complement environmental service payments. In response to environmental concerns, the

4. The Forest Act 1999 does not provide a definition of environmental services. Article 26 makes the following reference:

- 1) Utilisation of protected forest may be in the form of using areas of the forest, use of environmental services, and collection of non-timber forest products.
- 2) Protected forest is utilised through a licensing system (IUPK – *Izin Usaha Pemanfaatan Jasa Lingkungan*) for businesses to use the forest area, utilise environmental services and collect non-timber forest products.

Specific provisions for environmental service management under Indonesian forest policy

- Opportunities for utilisation of environmental services in the form of water use, eco-tourism, carbon sequestration and preservation of forestry and environment are made possible in both protected forest and production forest. Only eco-tourism is allowed in conservation forest (Article 20 and Article 27 of Government Regulation No. 34/2002).
- Environmental services can also be utilised in community forest (under production or protection categories) that functions as a conservation area (Article 26 and Article 28 of Forestry Decree No. P 26/Menhut-II/2005).
- Forest and land rehabilitation within areas of conservation forest (excluding nature reserves and core zones of national park) is included in the category of utilising environmental services, but it is not clarified as a form of allowable utilisation of environmental services (Article 41 of Act No. 41/1999 on Forestry).
- Community groups that are not registered as legal bodies are not allowed to get licences for the utilisation of environmental services (Article 24 of Act No. 41/1999).
- Fulfilment of procedures and formal prerequisites – including payment of permit fee for utilisation of forest product (IIUPH – *Iuran Zin Usaha Pemanfaatan Hutan*) and provision of forest resources (PSDH – *Provisi Sumber Daya Hutan*) – is required to get a utilisation licence (Article 35 of Government Regulation No. 34/2002).
- Aside from being able to utilise environmental services, community forest that functions as conservation area and protected forest can get incentive from government in the form of subsidy, soft loan, fiscal policy, regulation, easy access to services and technical assistance (Article 11 of Government Regulation No. P 26/Menhut-II/2005).
- Utilisation of environmental services from forest has limitations, such as prevention of planting of non-local species in conservation forest and prevention of changes to landscapes in protected forest (Article 13 (paragraph 5) and Article 14 (paragraph 6) of Government Regulation No. P 26/Menhut-II/2005).

national government created a system of reforestation grants in 1976, primarily to encourage logging companies to replant. An updated version of this programme, set up in 2003, is the National Movement for Forest and Land Rehabilitation, which provides grants and tax incentives. Conservation is also reinforced through the designation of forest areas into production, conversion and protection forests, which controls timber extraction from forest areas important to watershed services, at least in theory if not in practice.

Space for new financing mechanisms for watershed protection

Although Indonesian public policy does not provide specific frameworks for payments for environmental services, several laws and policies can be interpreted as providing basic rules and incentives. For example, Act 7/2004 on Water Resources provides many basic rules for launching water-resource conservation programmes and provides for upstream – downstream transactions to form the basis of an alternative financing mechanism (Article 21). The stated obligation of

water resource users to pay fees for management costs (Article 80) is currently interpreted as applying to infrastructure only, but could arguably be extended to watershed management. Law beyond the water sector is also relevant. Act 17/2000 on Income Tax provides for private expenditure on environmental protection to be reclaimed from tax by the business sector (Article 2, paragraph 1a). Meanwhile Act 23/1997 on Environment Management provides a set of basic rules for developing a financing system for environment conservation programmes (Article 8, paragraph 2e). Development plans similarly include basic text under headings such as 'Development of incentive and disincentive systems in natural resources protection' and 'Formulating alternative financing systems for environment'. Constraints in the broader policy framework include conflicts between forestry policies and water-resource policies, lack of clarity in the division of authority and responsibilities between neighbouring district governments, and the multiple burdens of water taxes and fees prescribed under different sections of the law and local regulations.

Local innovations

Initiatives to experiment with new financing mechanisms have emerged sporadically, forming the basis for site selection in this project. In the Cidanau watershed (Banten Province), a multi-stakeholder management forum for the watershed was established in 2002, which facilitated the introduction and adoption of an environmental service payments mechanism with the local water management company. Similarly, debate on water management led to a working group in Lombok (West Nusa Tenggara Province), which initiated implementation of a payments approach via development of a new district-level regulation. Meanwhile several government agencies have been working together in Brantas watershed (East Java Province) since early 2005 to issue a provincial regulation on alternative institutions for environmental services finance. The Cidanau experience has progressed further towards institutionalising the environmental service payment concept within government policy statement and practice than the other two sites, perhaps because of the better opportunities to learn from and build on empirical experience.

2.2 Brantas catchment

Overview

The Brantas River catchment covers approximately 12,000 km² of East Java Province. The 320 km main river originates at Mount Anjasmoro and flows into the Madura Strait near the major city of Surabaya (Map 1). The climate is dominated by tropical monsoons, with a mean annual rainfall of 1,850 mm (much lower than in western Java, where the other site, Cidanau, is located), falling mainly in the November – May rainy season. The total population across the catchment was 15.5 million people in 2003, with a population density of 1,260 people per square kilometre,

largely concentrated in the flatter lowlands rather than the higher, steeper mountain reaches. Average annual incomes are estimated to be well over €1,000 per annum, and generally higher than averages for other parts of Indonesia. The highest proportion of gross regional domestic product is derived from the industrial sector (34%), whereas agriculture contributes only 11%. Farm sizes are around 0.1 – 0.3 ha, small by world standards but typical of Java.

Micro-site selection within the catchment

Micro-sites for environmental service payments were selected by PJT1 (the buyer of watershed protection) according to its identification of the greatest problems with downstream sedimentation. Of its two initial choices, one was adjacent to the 11 ha arboretum that encloses the 12 main springs feeding the Brantas River. The arboretum suffers repeated flood damage, which is blamed on poor land management practices in surrounding areas. YPP did an in-depth survey at Tulungrejo and found a great deal of conflict over land tenure and land use. Discussions among YPP, PJT1 and LP3ES led to rejection of Tulungrejo as a pilot site despite its priority need for conservation interventions. The resulting two selected micro-sites were Tlekung in Upper Brantas sub-watershed, which supplies the Sutami (Karangkates) Dam, and Bendosari in Upper Konto sub-watershed, which supplies the Selorejo Dam. A further micro-site, Sukomulyo Village adjacent to Bendosari, approached facilitators in the second year to seek inclusion in the project, and PJT1 agreed to expand payments to include this group.

Land and hydrology

The main concern around water supply in the Brantas catchment is siltation of watercourses and reservoirs, particularly those used for hydropower. Sedimentation in dams reduces their storage capacities and in turn reduces water supply for downstream uses. In addition, sediment material contains chemicals that can affect water quality (for example for drinking and fisheries). Unstable slopes and riverbeds, volcanic eruptions and surface erosion are the key factors associated with sedimentation (Omachi and Musiaka 2004). In total, sediment yield from slope failure and riverbeds accounts for 115 million m³ sediment yield (at least 30,000 m³/km²/yr), followed by volcanic eruption (105 million m³ at highly variable annual rates) and surface erosion (43 million m³ at a minimum of 5,000 m³/km²/yr) (Nippon Koei 2005).

Volcanic eruption sediments are particularly derived from Mount Kelud. The mean sediment for one eruption was quantified around 100 – 200 million m³, creating a massive one-off impact on sediment levels in the river and its dams. More recently, in 2006, eruption of a mud volcano in Porong District of the Brantas catchment has caused outflow of up to 130,000 m³ per day of sulphurous mud, which may continue for years or even decades (Cyranoski 2007).

Site profile

Table 2 below gives the characteristics of the Brantas watershed.

Table 2

Site profile for Brantas	
Downstream	
Mean discharge	94 m ³ /s, ranging from 28 m ³ /s to 207 m ³ /s
Main water uses	Domestic, industry, irrigation, fisheries, electricity
Main water uses	Domestic users: consumers in Surabaya, Sidoarjo, Malang Metal, food, glass, cigarettes, sugar, pharmaceutical and chemistry industries 304,000 ha technical irrigation systems and approximately 83,000 ha non-technical irrigation systems 15,000 ha fishery area in Brantas Dam Ten hydropower stations generating 1 billion kW/year
Volume of each use	Domestic: 225 million m ³ /year Industry: 140 million m ³ /year Irrigation: approximately 2.5 billion m ³ /year
Water abstraction	For domestic use, the water is abstracted from seven points by PDAM in Sidoarjo, five points by PDAM in Surabaya and one point by PDAM in Malang For irrigation systems the water is abstracted from nine irrigation systems in Blitar, Tulungagung, Kediri, Nganjuk, Mojokerto, Jombang, Sidoarjo For electricity, the water is abstracted from ten stations in Malang, Blitar, Nganjuk and Tulungagung
Constraints in term of total flow, regularity and quality	Increasing sedimentation in hydropower dams threatens sustainable operations Deterioration of water quality, but more because of downstream industrial waste outlets than upstream, domestic & agricultural run-off Water shortages, particularly in the dry season Erosion, flood and landslide Competition in accessing water between PDAM, irrigation systems and industries
Cost of maintaining water flows and water quality	PJT 1 spends IDR26,500,000 (€2,300) on operations and maintenance and IDR724,000,000 (€62,700) on environmental protection in the Brantas catchment area per annum (spending on dredging of dams not known)
Upstream	
Owners/beneficiaries of the lands	Community Government Perhutani (state-owned forest company)

Actual land uses	Rice fields: 3,180 km ² (27%) Gardens: 480 km ² (4%) Dryland (non-irrigated) fields: 2,700 km ² (23%) Forest: 3,171 km ² (26%) Settlement: 2,328 km ² (19%) Others: 144 km ² (1%) Total: 12,000 km ²
Specific land use and land management activities thought to affect water flows and quality	Erosion leading to downstream sedimentation associated with (a) inappropriate land use and land management in farming areas and (b) illegal logging and conversion to agriculture in state forest areas Pollution from domestic and agricultural waste
Economic returns	Revenue for local government from housing complexes, hotels and resorts Agriculture, particularly cash crop vegetables Fodder and fuel wood from forest areas
Non-economic benefits	Availability of water for local domestic and economic uses

Apart from volcanic events, erosion associated with upstream land uses is considered a major factor in downstream sedimentation (Lavigne and Gunnell 2006). The Indonesian government uses a land classification system to identify areas of critical concern for erosion. The Forest Guidelines for Indonesia designate all areas with a slope of equal or greater than 40% and elevation of more than 2,000 m above sea level as protection forest (land function I), assigned to conservation purposes. Buffer areas (land function II) include forestry production areas and agricultural land, whereas the other category covers all other land uses. Critical areas for surface erosion occur under all three land functions (Table 3). Devastated areas, defined as completely bald or grassland collapsed at middle to lower portion of the slope, are especially difficult to regenerate owing to scant soil. GIS analysis indicates that devastated areas in the Brantas catchment amounts to 39.6 km², not a huge proportion of the watershed, but accounting for high aggregate contributions to surface erosion over the years (Nippon Koei 2005).

The main human factors thought to affect water flows and quality in the Brantas catchment are:

- *Unsuitable land use and land management in steep areas:* annual crops and vegetables are preferred for rapid returns on investment, but are associated with higher levels of erosion than perennial tree crop and agro-forestry options. Furthermore, incorrect terracing, such as incomplete bench terraces, overly

Table 3

Characteristics of critical areas in the Brantas catchment

Land type	Characteristics of critical areas within that land function
Land function I	– Bare land, devastated forest, grassland and conversion to dryland agriculture
Land function II	– Bare land, devastated forest and grassland – Agriculture on highly sloping land, poor land management (for example poor terracing and unprotected bare land)
Other areas	– Water fronts (dam and river bank erosion) – Public roads with collapsed slopes

Source: Directorate General of Water Resources, Ministry of Public Works, 2005.

steep terrace planes in excess of 8%, furrows following the slope direction, and incomplete waterways without a drop structure, are fairly common in upland dryland fields, leading to deep and irregular erosion in water ways as well as high levels of surface erosion. Of the 887 ha of dryland agriculture in the sub-watersheds of Upper Brantas, Lekso, Upper Konto and Brangkal, only 23% have all the features of good terracing.

- *Uncontrolled logging*: intensive illegal logging, either for timber or to clear land for agriculture, has completely cleared portions of the sub-watersheds of Upper Brantas (13 km²), Lekso (3 km²), Upper Konto (8 km²), and Brangkal (13 km²). However, illegal logging has been decreasing recently owing to reinforcement of inspection.
- *Pollutants from agriculture, industry and households*: a study by JICA (1998) found a tendency in Brantas River for water quality to deteriorate during the rainy season owing to wash-off from industrial, domestic and agricultural waste.

Interventions in watershed management

Since decentralisation to district-level governments came into force in Indonesia in early 2001, management of river bodies across district borders has been an important institutional and legislative challenge. Integrated management bodies, of which PJT1 is the prototype are based on the principle of 'one catchment, one management'. PJT1 is legally a parastatal corporation, set up in 1990. It is responsible for the management of all aspects of infrastructure, flow, water quality and environment along the full Brantas catchment as outlined below.

Technical aspects

PJT1 is responsible for development and maintenance of water resource infrastructure, flood control, pollution control, water allocation and reservoir

operation rules. It manages watersheds through construction of check dams, periodic excavation (dredging), reforestation and re-greening. Taking water from the Brantas River is not allowed without a licence issued by the local government, based on technical recommendations from PJT1. In the dry season, PJT1 sets reservoir operation rules based on demand figures submitted by major users (industry, the domestic water company PDAM and the hydropower company PLN). In the rainy season, PJT1 focuses on flood control, based on an intensive forecasting and warning system. It runs a pollution abatement programme based on monitoring at 50 sampling points along the Brantas River, and in 41 outlets of industrial pollution sources are collected and tested in the laboratory of PJT. PJT1 also works with a variety of educational and civil society organisations to improve public awareness of water quality and environmental management. Smaller-scale interventions by the private sector, such as Unilever's Clean River Programme (Unilever 2003) have supported the work of PJT1.

Financial aspects

PJT1 works on the principle of full cost recovery, in which major beneficiaries such as PLN, PDAM and industries contribute financially towards the technical activities of PJT1. Tariffs are set according to a business model. PJT1 holds responsibility in the Brantas catchment for collection of water service fees that are set mutually by the management group (see below). Services are provided on a contract basis for transparency and security.

Management aspects

A basin management committee, comprising governmental agencies, representatives of sectoral users, NGOs and experts at the provincial and watershed level, makes decisions on key issues such as water service fees and allocation of water. This committee, PPTPA (*Panitia Pelaksana Tata Pengaturan Air*), determines activities of the operator PJT1. PJT1 is also subject to various management audits and controls, with ISO 9001-2000 in use since 1997.

2.3 Cidanau catchment

Overview

The Cidanau River catchment is much smaller than the Brantas, covering approximately 220 km². Administratively, the catchment crosses only two districts, Serang and Pandeglang, within Banten Province on Java's western coast. Mean annual rainfall is over 3,000 mm, varying from 50–90 mm per month in the dry season (June–October) up to 130–350 mm per month in the rainy season (November–May). The total population is about 133,000, of whom 36% are farmers.

Farm sizes range from 0.2 to 0.5 ha. A common livelihood is home industry, ranging from manufacturing traditional foods through to assembling electronic equipment. Annual incomes range between €500 and €2,600 per capita per annum. Large-scale industry is, meanwhile, the largest source of regional domestic product (25%), concentrated in the industrial zones supplied by the Cidanau River.

Micro-site selection within the catchment

In contrast to the Brantas catchment, specific micro-sites within the Cidanau catchment were chosen by Rekonvasi Bhumi and LP3ES rather than by the buyer of environmental services. Agreed selection criteria were: (1) categorisation of the area as a high contributor of sedimentation from defined critical lands; (2) residents tend to fell trees at a high rate; and (3) land at the location belongs to residents and is not far from their housing. Through these criteria, dryland field areas within Citaman Village in Ciomas sub-district and Cibojong Village in Padarincang sub-district were chosen.

Land and hydrology

The 23,000 ha of the Cidanau catchment comprise a lowland plateau, 100 m above sea level, and upland sloping watershed areas of around 12,000 ha draining 21 sub-watersheds. The plateau was once entirely a lake, but was blasted and drained by the Dutch government in 1825 to lower the water level and thus make the land suitable for rice production. Today there is a remaining area of swamp forest, Rawa Danau (2,500 ha), nominally protected as a nature reserve, whereas the remainder of the plateau is under rice cultivation and housing. Conversion of land use to agriculture and settlement is predicted to increase as the population of the area continues to grow (Yoshino *et al.* 2003).

The main problem with water supplies from the Cidanau catchment is sedimentation in reservoirs and water channels. Volcanic processes are thought to be the main natural cause, causing hot mud to rise to the water's surface and then settle as sediment. Erosion-prone soils are another factor influencing water problems in the watershed. Apart from natural factors, sedimentation is blamed on land conversion in the sensitive upper catchment areas, causing the observable changes in water quality and quantity in recent years. The number of people living and farming illegally in the protected area has increased from around 600 in the late 1990s to an estimated 1,500 today. They have converted well over 400 ha of conservation forest to fields of rice and other crops.

Site profile

Table 4 below gives the characteristics of the Cidanau watershed.

Table 4

Characteristics of critical areas in the Brantas catchment

Downstream	
Mean discharge	32 m ³ /s, with a wide annual and inter-annual range
Main water use	Domestic, industry and irrigation
Main water users	Domestic users: 159,000 consumers of Cilegon PDAM 120 industries, including PT Krakatau Steel, PLTU Suralaya, industries in Krakatau Industrial Estate Cilegon, and chemistry industries in Ciwandan and Merak 55 ha irrigation area
Volume of each use	Domestic: 30 million m ³ /year Industry: 35 million m ³ /year Irrigation: 173,000 m ³ /year
Water abstraction	For domestic and industry use, the water abstracted by KTI through a channel starting approximately 0.5 km from the Cidanau river mouth and 28 km long to KTI plant For irrigation systems the water is abstracted from tributaries of the Cidanau River
Constraints in term of total flow, regularity and quality	Relatively high fluctuation of total flow High concentrations of silica and nitrogen stimulating eutrophication and blockage of water supply channels Increasing occurrence of flooding around the Rawau Danau Nature Reserve In some areas, water scarcity in the dry season Potential future conflicts among abstraction plans by different companies
Cost of maintaining water flows and water quality	Per annum KTI spends IDR120 million (€10,400) cleaning the Cidanau River, IDR500 million (€43,300) maintaining infrastructure of water processing and a sum of funds for supporting management of the Cidanau watershed
Upstream	
Actual land uses	Rice field: 6,786 ha (31%) Shrub: 5,982 ha (27%) Mixed garden: 3,471 ha (16%) Swamp: 1,936 ha (1%) Dry farm land: 1,926 ha (9%) Forest: 1,539 ha (7%) Settlement: 397 ha (2%) Total: 22,620 ha (whole catchment)

Owners/beneficiaries of the lands	Community Government Perhutani (state-owned forest company)
Specific land use and land management activities thought to affect water flows and quality	Clearance of natural vegetation on upland dryland fields and illegal logging in state forest areas Rice cultivation in and around the Rawa Danau Nature Reserve Waste products from poultry, fisheries, fertilisers and post-harvest burning Increase in area under settlement
Economic returns	Agricultural products as dryland rice and cassava Mixed garden products, for example melinjo (<i>Gnetum gnemon</i>), pete (<i>Parkia speciosa</i>), durian (<i>Durio zibethinus</i>) and banana (<i>Musa acuminata</i>) Home industries and employment
Non-economic benefits	Availability of water for domestic and economic uses Stability of temperature and climate

Waste from chicken coops and fishponds, along with use of fertilisers and post-harvest burning of rice paddies, causes run-off with high concentrations of nitrates, phosphates and silicates. The other important consequence of current farming practices is the high level of erosion from steep upland non-irrigated fields. About 4,300 ha of the Cidanau catchment, 20% of the total area, are categorised as critical for surface erosion under national criteria.

Specifically, problems related to raw water from the Cidanau River are:

- *Perceived decreases in total annual debit and dry season flows*: there is a sense among KTI staff and downstream water users that total annual water flows, particularly dry season low flows, have been decreasing in recent years. During the dry season, the water debit is no longer able to meet the raw water requirements of Cilegon Municipality and Serang District. However, measurements of water flows in the Cidanau River do not reveal a downward trend, so the inability to meet requirement for raw water may be a function of demand rather than supply (Figure 2).
- *Sedimentation and eutrophication*: muddiness of water in the Cidanau River rose from an average of 8.5 nephelometric turbidity units (NTU) in 1999 to 122.3 NTU in 2005. Erosion in 2005 was estimated at 146 tonnes per hectare per year, with actual sedimentation of 479,488 tonnes per year (KTI data). High nutrient loads compound the direct effects of sediments blocking downstream waterways, promoting the growth of weeds. KTI faces an annual problem of blockages in its 28 km water channel and pump.

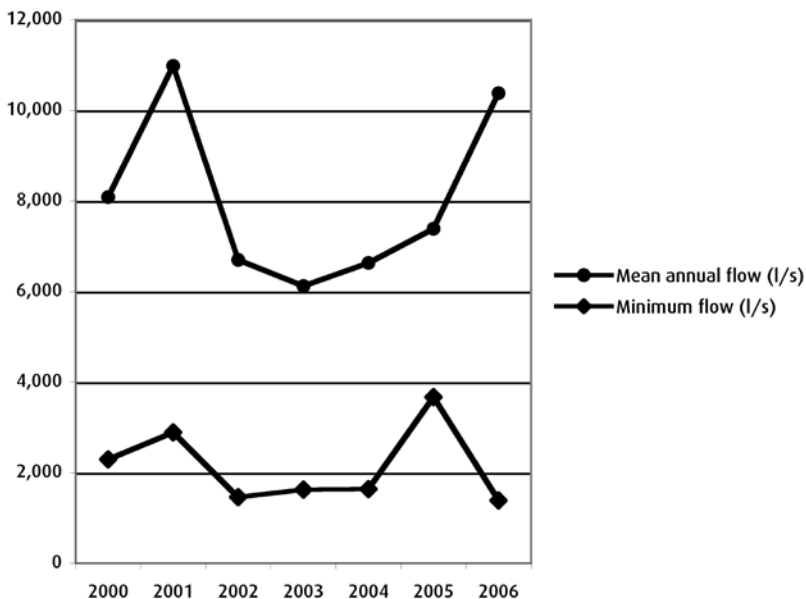
Challenges to effective management of the Cidanau catchment are expected to grow as the demand for water increases. The Krakatau Steel Group plans to enhance its production capacity to one million tonnes per year by 2008, requiring an additional water supply of around 5.5 million m³ per year. Predicted growth in other industries should push the total water demand from the river to 54 million m³ per year (1,700 litres per second).

Interventions in watershed management

The water supply problems in the Cidanau catchment have led to some extreme suggestions. For instance, in 1999 the United Nations Environment Programme (UNEP) recommended restoring the water level of Rawa Danau to pre-1825 levels by constructing a small dam around the original outlet, to stop people from using the area for farming. While improving the quantity and quality of water, this solution would have extreme negative socioeconomic and human rights consequences because the people in the area would have to be relocated.

Figure 2

Mean annual flows and minimum flows in the Cidanau River



Source: Krakatau Tirta Industri Production Department.

Local government has intervened on watershed protection in several ways, including:

- *The Regional Development Planning Agency in Serang District (BAPPEDA)* did a study of the status and utilisation of Rawa Danau in 1993–1994 to address opportunities and problems and formulate an environmental management plan. Unfortunately the lack of consultation and joint planning meant that not many government departments or other agencies were willing to support the plan.
- *The Provincial Forest Conservation Office* has been involved in setting formal forest boundaries in 1979–1980, revising these in 1996, reforesting 200 ha in 1986, forcing the transmigration to Sumatra of 274 households living within forest boundaries in 1987, rehabilitating the Rawa Danau Nature Reserve and river boundaries, carrying out routine patrols, educating local people in biodiversity resource conservation, and undertaking studies on indigenous and invasive fauna and flora.
- *The Land Rehabilitation and Soil Conservation Office for the Sub-watersheds of Cijung and Ciliwung* has rehabilitated Rawa Danau through the planting and maintenance of *Elaeocarpus littoralis*, *Urostigma rumphii* and *Sarcocephalus cordatus*, and established an agroforestry buffer of 200 ha next to Rawa Danau.

However, perhaps the greatest efforts towards maintaining water quality and quantity have been made by the private companies that rely on water supplies from the Cidanau River to the industrial areas of Cilegon City. The main agent is KTI, a subsidiary of Krakatau Steel, which has a memorandum of understanding with local government for the supply of commercial and domestic water in Serang and Pandeglang Districts, including a hydropower station. KTI and its parent company have a long history of engagement in water issues at Cidanau, leading conservation, weed clearance, dredging and hydrological research programmes over the past 30 years, in partnership with a range of government departments. More recently KTI has participated in the *Forum Komunikasi DAS Cidanau* (Communication Forum for the Cidanau Catchment). Spurred by international experience and civil society encouragement, KTI has worked to develop the environmental service payment scheme described in the Section 3.

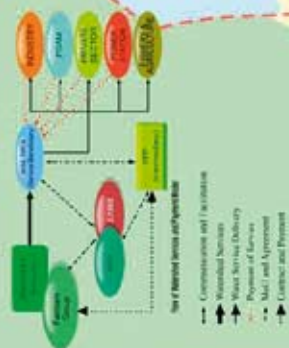
Cidanau Watershed, BantenProvince

Area of Development of Upstream-Downstream Transaction Mechanism



BRANTAS WATERSHED, EAST JAVA

Area of Development of Upstream-Downstream Transaction Mechanism





Fisherman casting net on Selorejo Dam on the Brantas River. Silting of dams such as Selorejo is the critical watershed management issue in the Brantas catchment.

Photo credit: Sonja Vermeulen



The PTJ1 office in Malang in the Brantas catchment. PTJ1 is a parastatal body for integrated watershed management, the first of its kind in Indonesia.

3 Progress and problems

3.1 Payment mechanisms developed

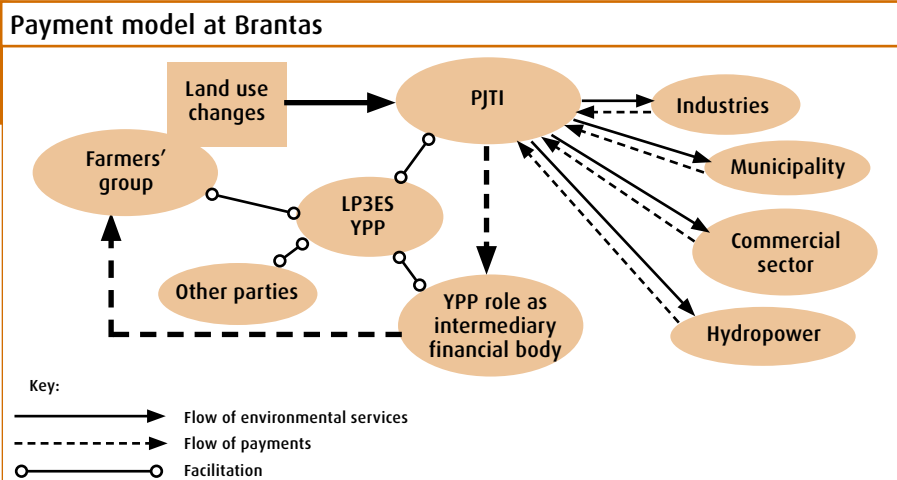
Brantas

Genesis of the payment mechanism: The management body of the Brantas catchment, PJT1, has long since seen upstream land management as an alternative to downstream dredging and cleaning operations in maintaining water supplies for hydroelectricity and other uses. In the past, it has transferred its full conservation budget to district forest offices to undertake tree planting on state and private land. Information sharing and lobbying by LP3ES persuaded PJT1 to enter into a pilot payment scheme with private landowners, small-scale farmers with fields of 0.1 – 0.25 ha in critical upland areas. The NGO team of LP3ES and YPP then acted as an intermediary to ascertain interest and preferences among farmers in the areas identified by PJT1 as being the greatest contributors to downstream sedimentation. YPP continued throughout the process to act as a facilitator between PJT1, farmers and relevant government line agencies.

Payment model: Facilitators LP3ES and YPP proposed either a direct payment from PJT1 to farmers, or an indirect mechanism via an intermediary. PJT1 preferred an indirect transaction, because of: (1) their lack of experience in working with farmers; (2) the fact that farmers' groups are not formally registered and hence cannot operate bank accounts; and (3) administrative constraints (transaction costs). PJT1 asked YPP, being an organisation trusted by both sides, to act as an intermediary financial body, at least in the short-term. The facilitating NGO LP3ES also remains a major influence in the model (Figure 3). Under two contracts (signed in 2004 and 2005), PJT1 agrees to provide payments of IDR54 million (€4,680) over a two year period, with an option for renewal. In addition, the district forest office has come on board and provided IDR5,715,000 (€495) for development of a village seedling garden, whereas Perhutani (the state-owned forestry company) has allowed farmers' groups to manage 0.25 ha of its land for the seedling garden and orally have given a licence to one farmers' group to manage six springs within an area of state forest under Perhutani control. In return, the farmers have undertaken agroforestry planting on 40 ha of identified critical land under their individual ownership, and put in place high quality terracing. The contract obliges YPP to facilitate implementation of the transaction and to submit periodic narrative reports and financial arrangement with photo documentation, including reporting on the growth and survival of the planted trees. PJT1 retains the rights to check project sites before contract implementation, conduct monitoring and evaluation of the

project, recommend improvements in implementation, and access information on progress. PJTI makes payments on condition that targets for planting and survival of seedlings and maintenance of terracing are met. So far three payments have been made, in 2004, 2005 and 2006.

Figure 3



Organisation of farmers' groups: Two farmers' groups initially entered into contractual arrangements with YPP: Tlekung Village and Bendosari Village. In the second year some neighbours of Bendosari, living in Mbakir Hamlet of Sukomulyo Village, approached YPP of their own accord, asking to join the scheme. This group has brought a further 27 farmers and 11 ha into the scheme, via management of state forest land rather than private land. These farmers, in concert with members from Bendosari, have also agreed to conserve forest land around the Katesan and Kalianget Springs, the primary sources of water for Bendosari and Sukomulyo Villages. The Tlekung Village Group also spread to a neighbouring hamlet in the second year, doubling membership. Each of the farmers' groups has a short written constitution and elected leaders, with an basic agreement to: (1) work to conserve the environment; (2) create productive business; (3) hold regular meetings (at least twice a month); (4) maintain group unity; and (5) implement joint action plans. So far the groups have deliberately chosen not to legally register, which would for example allow them to open their own bank accounts, because they prefer to avoid administrative burdens that would take time and energy away from their immediate on-the-ground actions.

Use of payments: Farmers' groups may use payments as they please so long as the conditionalities for further payments are met. The groups have opted for a mix of environmental, business and social investments (Table 5). Farmers' groups have paid out piece-rate wages to members for some activities, but have also given a substantial amount of free labour to ensure that environmental protection services are provided.

Table 5

Allocation of payments by farmers' groups at Brantas

Village	Payment date	Total payment (IDR)	Number of members	Tree planting Numbers planted	Species	Investment	Other	
							Use	Investment (IDR)
Bendosari	2004	9,500,000	36	3,090 on 7.5 ha	Durian	8,000,000	Local business development	1,500,000
					Clove			
					Pete			
	2005	12,000,000	52	5,000 on 16 ha	Coffee	10,500,000	Purchase of goats	1,500,000
					Sengon			
					Suren			
	2006	5,840,000	77	2,500 on 10.5 ha (state land)	Durian	5,000,000	None	
					Pete			
					Sukun			
Sukomulyo	2006	5,840,000	27	2,500 on 11 ha (state land)	Durian Pete Sukun Miri Suren	5,840,000	Development of tree nursery	840,000

Village	Payment date	Total payment (IDR)	Number of members	Tree planting			Other Use	Investment (IDR)
				Numbers planted	Species	Investment		
Tlekung	2005	25,500,000	66	5,014 on 17.57 ha	Durian Pete Mango Avocado Hairfruit Teak Sengon Mahoni Coffee Clove	10,321,000	Livestock fodder and husbandry Social donations (mosque, charities, music gp)	15,179,000
	2006	24,750,000	135	9,884 on 20 ha	Durian Pete Mango Avocado Hairfruit Genite Teak Sengon Mahoni Coffee Clove	12,582,000	Local business development	12,168,000

Negotiation, development and learning: Early in the negotiation of contractual terms, the farmers' groups proposed that they first invest in establishing local tree nurseries before planting out on their fields. PJT1 rejected this proposal as its primary concern was to increase vegetation cover as quickly as possible: the fund should instead be used directly to buy and plant saplings. The lesson from this experience was that saplings bought from outside the village did not suit local conditions. Through self-initiation and self-finance, the farmers' groups established village nurseries. Later the groups in Bendosari and Sukomulyo were successful in lobbying the district forest office to supplement their efforts with a grant towards their nursery (IDR5,715,000, equal to €495). Farmers here also proposed that they undertake local civil engineering works – construction of gully plugs, check dams and drainage canals – to better prevent erosion and subsequent downstream sedimentation. Again, there was resistance to these proposals as the district government argued that the standards required in civil engineering could only be met by contractors and not by local people. After several recent incidents of poor construction by contractors brought into the area, the district forest office has now indicated that they would be willing to consider proposals submitted by the local community to undertake civil engineering works surrounding the state forest area.

Sellers' perceptions: Initially farmers, particularly women, were reluctant to join the programme as they have had negative experiences with previous tree-planting initiatives. The expansion of membership over time reflects the members' appreciation of the contractual nature of the agreement in which they are free to invest funds as they wish so long as land-use change targets are met. Farmers comment that they have been disappointed by government reforestation exercises, which offer much greater per hectare financial assistance than the current environmental service payment scheme, but specify species, spacing, time to plant, source of seed stock and so on, and that they have more confidence in a scheme in which they can make their own decisions. On the other hand, they are not entirely convinced of the future economic returns from agroforestry, as promised returns on timber species (such as teak) and fruit species have not emerged in the past, largely because of the high rates of disease infestation. Most farmers continue to prefer vegetables as a cash crop. The kinds of vegetables that get quick returns (for example cabbage) do not grow well among or under trees.

Buyers' perceptions: PJT1 is pleased with progress and adherence to contracts by YPP and the farmers' groups. The company is less convinced, however, that there will be detectable positive impacts on sedimentation of downstream dams. One of the biggest issues here is scale: 40 ha is a tiny proportion of a very large watershed. PJT1 has indicated that it is willing to consider scaling up to incorporate all land in the critical category that is under private ownership, but that this would

require a strong set of intermediaries to deal with the many farmers' groups. Its current budget does not extend to this level of conservation on private lands, so pilot schemes would need to demonstrate real savings in dam and waterway maintenance costs at the local level for PJT1 to commit to scaling the scheme up to the whole watershed.

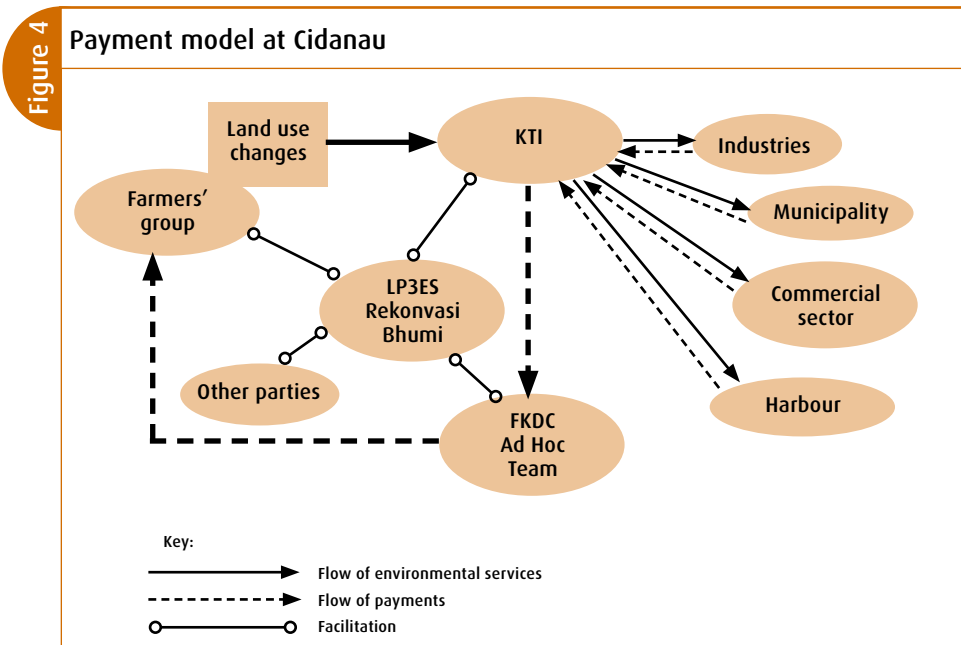
Outlook: YPP is trying to expand interest – and hence potential investment – among downstream water users beyond PJT1. About 400 large- and medium-scale industries draw water from the Brantas watershed. A recent seminar help by YPP attracted 70 of these. Participants from industry and commerce recommended establishment of an independent intermediary organisation for the whole Brantas catchment, to channel funds from buyers to sellers. A subsidiary organisation of PJT1 may be an appropriate intermediary on behalf of the consumers that they serve. YPP could continue to represent upstream farmers who provide environmental services. YPP's ongoing cooperation with the governmental regional coordination board (*Bakorwil III*) and PJT1 has established a working group for Greater Malang City, bringing together several government agencies with a mandate to establish an intermediary body and formulate a memorandum of understanding for the government of the Greater Malang. The lack of a legal precedent at national level is stalling progress, but the working group continues to act as a conduit of information on the Brantas experience to government agencies from other regions.

Cidanau

Genesis of the payment mechanism: Discussions about the possibility of implementing a local direct payment mechanism to fund maintenance of watershed functions began in the *Forum Komunikasi DAS Cidanau* (FKDC, or Cidanau Catchment Communication Forum). The FKDC, a multi-stakeholder forum of government agencies with some representation from beyond government, has met over five years to develop a coordinated approach to managing the Cidanau catchment. The main potential buyer of services to maintain water quality and quantity at Cidanau is PT KTI, the company that holds the contract to manage water distribution from the Cidanau River to domestic and industrial consumers. KTI is concerned with long-term sustainability of water supplies and believes that maintaining the integrity of upstream ecosystems will be cheaper than dredging downstream waterways, repairing damaged infrastructure and restoring forested areas in the future. Hence KTI has been proactive in developing an environmental service payment mechanism with FKDC.

Payment model: KTI voluntarily pays IDR175,000,000 (€15,160) per 50 ha for the first two years (2005-2006) and IDR200,000,000 for the next two years towards

maintenance of environmental services in the Cidanau catchment. An intermediary financial body was deemed necessary to channel funds. The temporary solution is a subsidiary of the FKDC, known as the Ad Hoc Team. The intention in the longer term is to replace this with a permanent management institution. The Ad Hoc Team has nine members (seven from government, one from KTI and one elected from the farmers' groups) who collectively hold the mandate from KTI to manage and disburse funds to the farmers' groups. The Ad Hoc Team has written contracts with these groups. Each farmers' group receives IDR1.2 million (€104) per 500 trees planted, which at recommended planting densities is IDR1.2 million per hectare. Planting is conducted and controlled by the members of the farmers' group, working towards a five-year target of 50 ha of replanting on critical land (25 ha in each of two villages). Farmers' groups may apply for payment whenever they believe that they have met the target of 500 new plantings, with the maintenance of previously planted trees. If a farmers' group does not fulfil this minimum requirement, the group is not paid until improvements are made. The Ad Hoc Team verifies planting and maintenance on behalf of KTI. Payments started in 2005 and will continue until the system is reviewed after five years. The facilitating NGOs Rekonvasi Bhumi and LP3ES also remain key participants in the payment system, linking and advising both the buyers and the sellers (Figure 4).



Organisation of farmers' groups: Each farmers' group has a simple constitution agreed to by members, laying out procedures for electing leaders, making decisions and setting workplans. Membership of a farmers' group is open to all adults in a village. The groups take full responsibility for meeting agreed planting targets and investing in appropriate and equitable local development. There are 43 farmers in the group in Citaman and 29 in Cibojong. Differently from Brantas, where membership is open to any adult in the village, membership at the two Cidanau micro-sites is limited to farmers who cultivate the areas defined as critical land for surface erosion under the national criteria.

Use of payments: Farmers' groups spend 95% of payments on seedlings and planting costs and the remaining 5% on local business priorities debated and selected in group meetings. So far, the Citaman Village farmers' group has invested in: (1) six goats, which have now doubled to 12 and employ eight caretakers on a rotary system; (2) equipment for production of vegetable crackers (derived from local non-timber forest products), now employing 15 women in home industry; (3) initiation of a tree nursery with species of melinjo (material for vegetable chips), pete (fruit), albasiah, and mahoni (timber) using 8000 polybags; and (4) improvements in the drinking water pipelines from the spring to the village reservoir. All group members have been involved in these works but do not have to pay, whereas non-members are obliged to pay a service fee of IDR3,000 (€0.25) per month or 1 kg of rice. The Cibojong farmers' group has invested in: (1) initiation of a tree nursery with 5,000 polybags of melinjo (fruit) and mahoni (timber); (2) equipment for production of banana crackers, employing six families; and (3) equipment production of vegetable oil, for which 14 ha of farming land have been planted with nilam (raw material). The facilitating NGO Rekonvasi Bhumi has supported farmers' groups' business decisions by helping them access entrepreneurship training with the Serang Service Office of Industry, Trade and Cooperatives, and advice on technical issues from the Environment Technology Agency (both government agencies).

Negotiation, development and learning: Negotiation of the payment mechanism was performed in three stages. First was discussion between the NGO Rekonvasi Bhumi and the Ad Hoc Team over a period of eight months. Next came five meetings between KTI and the Ad Hoc Team to draft a contract, over a further six months. Third was discussion between the Ad Hoc Team and farmers' groups in the villages of Citaman and Cibojong to draw up contracts laying out levels of payments and conditionalities. Farmers proposed a compensation figure of IDR2.5 million (€217) per hectare, based on the funding levels provided in government tree-planting programmes, to cover land preparation, ground cover, seedlings, transport, fertiliser and labour. The Ad Hoc Team offered compensation of IDR750,000 per hectare. In the end, payments were agreed at IDR1.2 million per



Outlet from natural spring at Citaman Village, Cidanau. The farmers' group has invested in improving the village's pipeline for drinking water.

payment date, provided 500 trees were planted and earlier plantings maintained. The first payment was made in May 2005 without a verification process. The second payment was disbursed in August 2005, 14 days after receiving the application from the farmers' groups and subsequent verification by the Ad Hoc Team. Verification showed that in Citaman Village one 0.5 ha location was unmanaged since its landowner had got a new job and moved from the village, but that elsewhere planting densities were above recommended densities. The third payment was made in December 2005: all planting and maintenance targets had been met. In December 2006 the Ad Hoc Team and KTI renegotiated the contract, with KTI agreeing to increase payments by 14% to a total of IDR200 million.

Sellers' perceptions: Farmers find the payment level of IDR1.2 million per hectare insufficient to make a meaningful contribution to their daily needs. Continuing replacement of trees on private land and encroachment into state forest land is likely as residents try to improve their immediate incomes. Farmers have had relatively little bargaining power with respect to the Ad Hoc Team and they feel

that the subsequent deal is of low value to them. Nonetheless, as time has gone on, more local residents have joined the farmers' groups. Participation in Citaman rose from 30% in 2004 to 88% in 2006 and in Cibojong from 5% to 64%. Farmers are ready to experiment with the scheme, but are concerned that the trees they plant will ultimately be claimed by government. Previous tree-planting programmes in their villages have not been particularly successful, for both technical and tenurial reasons.

Buyers' perceptions: The company KTI considers that it has invested heavily over the years in a wide suite of activities to maintain the total annual flow of water, continuous supply and quality of the Cidanau River, but positive results have not yet been felt. The environmental service payment mechanism is an experiment, which the company will continue but not mainstream until there is clear evidence that it constitutes a cost-effective approach to maintaining water quantity and quality. As at Brantas, there is an irresolvable circular logic: the sizes of the pilot schemes are likely to be too small to demonstrate watershed-wide gains, but buyers (particularly KTI's end-users) are reluctant to invest in watershed-wide activities unless gains are demonstrated. Nonetheless, KTI and local government remain committed to the experimental environmental payment schemes for the immediate future.

Outlook: The pilot environmental service payment scheme will continue for five years and will then be assessed. The experimental nature of the current scheme allows for adaptive management. For instance, the Ad Hoc Team is proposing that payments should be made less frequently, but should include a 40% upfront payment to farmers' groups so that they do not have to work in financial arrears. However, the 40% may not be enough to compensate the upfront expenses incurred by farmers in tree planting, given that they are spending 95% of funds received on the direct costs of tree planting and providing free labour on top of this. More infrequent payments will save on transaction costs to the buyers but shift a greater proportion of the scheme's opportunity costs and risks onto farmers. The FKDC is keen to see scaling up of the pilot scheme and increased material benefits, perhaps involving in-kind rather than monetary payments to farmers' groups. The use of in-kind payments will raise issues of the relative value and fungibility of cash versus non-cash transfers. The FKDC has selected two new locations to establish environmental service payments in 2007. The Serang District government is willing to match KTI's pledge of IDR200 million, in order to expand the scope of the experimental environmental service payment schemes.

3.2 Socioeconomic opportunities, impacts and limits

Changes in farmers' incomes and livelihoods

At the Brantas and Cidanau sites, payments have only been in place for two to three years, so it is too early to assess success of the schemes in improving livelihoods, but some preliminary observations can be made. The living conditions for many of the farmers involved in the scheme remain poor. The simplest qualitative indicator of this is that farmers' groups report that a proportion of their members are unable to provide their families with enough food. During the two years of project implementation, mean cash incomes of members of the payment schemes in Cidanau have fallen: from IDR4,941,000 (€428) per capita per year in 2004 to IDR3,739,000 (€324) in 2006 in Citaman; and from IDR6,986,000 (€605) to IDR6,310,000 (€547) in Cibojong. In Brantas, there were slight increases in income from IDR3,339,000 (€289) per capita per year in 2004 to IDR3,457,000 (€299) in 2006 in Tlekung and from IDR2,967,000 (€257) to IDR3,049,000 (€264) in Bendosari (Tlekung and Bendosari are the poorest villages in their respective districts according to government statistics). It is not possible to assess whether these changes in incomes are related to the payment schemes because there are no corresponding data for the period for households that are not part of the scheme.

Furthermore, these figures mask a large variance in the cash incomes of different members of the farmers' groups. Wealthier farmers own cattle and other livestock, whereas poorer farmers have very little land and rely mainly on piece-work labour for other local farmers to earn a living. Local non-farming opportunities are fairly limited. Young adults prefer to seek employment in urban areas, for example in the construction industry, rather than farming or engaging in other small businesses locally.

Involvement in the pilot environmental service payment schemes is voluntary, so there is no external determination of who is in and who is out of the scheme. Both women and men are members, usually as families. Owning at least a small amount of land is a prerequisite for accepting payments in return for land-use changes. Landless people, who make up 10 – 40% of the adult population at the Cidanau and Brantas micro-sites, are excluded. The only exception is the nursery scheme, in which the farmers' groups have specifically involved landless people, who are not able to participate in many other aspects of the schemes.

Are the levels of payment sufficient to compensate for land-use changes, particularly the opportunity costs of shifting from seasonal crops (rice, vegetables, fodder) to perennial tree crops? There is no simple answer to this question. Farmers see dryland farming as fundamentally unprofitable: rice yields are low and farmers report that they often leave vegetables in their fields unharvested because

fluctuating market prices are not attractive enough to merit their labour and transport costs. Tree crops are potentially far more profitable, but over prohibitively long timespans for low-income farmers and with high associated risks (especially production risks, mainly disease, and market risks).

Farmers in the scheme have welcomed access to potentially high-income tree crops such as melinjo, pete, jengkol (*Pithecollobium lobatum*) and durian. Local tree crop diversity has increased as farmers have had the capital to access seed from new sources. In addition to planting trees on sites agreed under the environmental service contracts, there has been a general shift from use of dryland fields for rice towards use of dryland fields for tree crops intercropped with vegetables, using cash to purchase rice from the market. Vegetables and tree crops can potentially provide higher cash return per hectare than rice on dryland fields, although there is tremendous variation and unpredictability in seasonal and long-term prices.

If payments for environmental services are to succeed in improving local livelihoods, they must go beyond compensating incurred costs to making providers better off. The schemes at Brantas and Cidanau involve a potential downturn in farmers' immediate livelihoods, because of switching from seasonal crops, which although not especially profitable are the preferred option at present for most farmers, to long-term, high-risk perennial tree crops. The current levels of environmental service payments to farmers cannot be said to be sufficient to compensate immediate opportunity costs and longer-term risks.

The direct payments do not make a meaningful contribution to the incomes of participating land-owning households. At Brantas, the total payment levels of about €5,000 over two years spread among many households make a miniscule contribution to farmers' incomes, and have a correspondingly low importance in their economic planning and broader worldviews. The situation at Cidanau is much the same, with 95% of the €104 per hectare being spent on the direct costs of planting, leaving little in the way of direct additional household income.

Paradoxically, although failing to provide adequate compensation, the payment schemes are already proving able to provide a springboard – in terms of monetary capital and social capital – to help farmers move beyond basic compensation into real improvements of livelihoods. The perceived value of the payments at both sites is their lump-sum nature, providing small amounts of immediately accessible start-up capital for new business ventures. Examples are discussed below.

New income-generating opportunities

Farmers' groups have invested part of the payments that they receive into provision



Goat breeding business in Tlekung Village, Brantas. The farmers' group has used environmental service payments to start up collective income-generating activities.

of the contractual land-use change (tree planting) and the remainder, from 5% in the two Cidanau micro-sites to as much as 60% at Tlekung Village in Brantas, to invest in local business opportunities, with the aim of improving members' incomes and livelihoods. Farmers have commented that their livelihoods have been based very much on agriculture and the sale of raw agricultural products, with little home industry and secondary processing in the village. Hence the groups welcomed the opportunity to invest a small lump sum of capital into diversification. Some examples of business investments by the farmers' groups are given below.

Goat breeding: All farmers' groups chose to invest in goat husbandry, which they consider a low-risk, high-yielding business in which they have plenty of experience as well as access to low-cost fodder. Cash from sales of milk and animals is split between reinvestment on behalf of the group and payments to the goats' caretakers, who work on a rotary system. One side effect of the goat breeding business is planting of hedges along terrace lines of dryland fields to provide fodder, with the added advantage of controlling soil erosion.

Fodder store: This initiative, in Tlekung Village, where 40% of income comes from livestock, is a response to the high price of purchased fodder in local markets. Discussion among the group led to the idea of less frequent bulk buying from a more

distant source at a much better price. The group now operates a fodder store, selling to members at cost price and at a slight profit to others in the village. The store is considered a great success and is able to sell 4 – 5 tonnes of fodder per week.

Tree nurseries: Farmers found that seedlings and saplings brought in from other locations fared badly, which they attributed to the stress of transportation and inability of the young trees to acclimatise quickly to local conditions. Driven by their obligation to meet planting targets, the groups developed nurseries, some with their own capital rather than with capital sourced from the environmental service payment. The farmers' groups in Brantas reported being surprised at the high demand for seedlings from local residents who are not members of their groups, to whom they sell at a small profit.

Manufacture of vegetable crackers and vegetable oils: Farmers' groups at the two Cidanau micro-sites sought and received training in agro-processing that they could apply locally. Members in Citaman (all women) trained to produce melinjo crackers, then purchased the necessary equipment and are now able to manufacture 200 kg over the two month production period, with a sale price of IDR15,000 per kilogram (€1). Members in Cibojong focused on patchouli processing, based on practices learned from migrants returning to the area from Aceh and from field trips to farmers' groups in Kuningan, Lampung and Cipanas in 2005. Farmers in Cibojong are still seeking equipment for distilling patchouli.

Spin-off partnerships

One of the most valuable outcomes for local livelihoods has been the diverse set of external partnerships that have developed as a result of the environmental service payment schemes. It is important to note the centrality of the facilitating NGOs here, who have used their own links and networks to attract partners as a deliberate strategy to mobilise and consolidate resources for local development. Some examples are given below.

Community Development Institute of Merdeka University: this university department backstops a system of low-interest bank loans from Bank Jatim dan Bank Nasional Indonesia to small-scale farmers. In this case, the condition set for receiving a loan was participation in conservation measures (terracing and planting of perennials). At present farmers in Brantas are borrowing a total of IDR40,000,000 (€3,465) at IDR1,250,000 (€108) per hectare.

Faculty of Livestock, University of Brawijaya: This university department has helped out with a goat insemination project at Brantas. The department also sells livestock fodder at a competitive price to the farmers' group fodder store in Tlekung.

Elementary school: For the purpose of raising environmental awareness among young people, the field facilitator at Tlekung Village has helped children at the local junior school to plant 700 saplings in their schoolyard, including fruit trees.

PT Perhutani: PT Perhutani is the state-owned forest company that manages much of the state forest in Java. Water problems encountered by communities in Bendosari and Sukomulyo forced them to negotiate with Perhutani for access to springs in state forest areas. Perhutani agreed to a community-based conservation programme around the springs, including: (1) a 12 ha area around the springs designated as a local protected zone (*kawasan perlindungan setempat*) under the management of the two farmers' groups, from which the groups are allowed to extract non-timber products; and (2) a provision of 1,000 m² within the state forest area for a tree nursery to be managed by the farmers' groups. Negotiation is under way to sign a written agreement between the farmers' group and Perhutani.

District Forest Offices: The successful negotiations with Perhutani encouraged the farmers' groups in Brantas to seek support from their local Forest Offices. The group at Tlekung has secured an in-kind grant of 3,000 saplings from the Batu District Forest Office. The Bendosari group, which had already set up a self-funded tree nursery, has been granted IDR5,750,000 by the Malang District Forest Office towards costs, which they have used to construct a small reservoir to water the nursery. The Forest Office has also given a few training sessions, for example on terracing techniques.

Other government departments: The Cidanau farmers' groups secured business training from the Industry, Trade and Cooperative Service of Serang District, and training in production of decorative garden plants from the Agriculture and Livestock Service Office of Serang, which they hope to develop into a profitable local industry.

3.3 Environmental opportunities, impacts and limits

Tree planting

Planting of trees has been the major land use intervention at both sites. NGO facilitators, government staff and staff from buyer companies all agree that tree planting is the best means to bring about desired changes in water flows and quality downstream: specifically reduced sedimentation (of concern at both Brantas and Cidanau) and higher dry season flows (of concern at Cidanau). At present, the payments are made specifically to undertake planting of trees on farmers' dryland fields. The number of trees and the area under trees are the indicators used to measure achievement of environmental services at both sites.

It is useful to examine our existing body of knowledge on the relationships between land use and hydrology to ask whether tree planting is necessary and sufficient to bring about the desired changes in water quantity and quality downstream. A comprehensive review of studies on the hydrological functions of tropical forests in southeast Asia (Bruijnzeel 2004) drew the following conclusions about impacts on dry season flows and sediment loads.

Water flows: Reduction in tree cover (forest clearance) is associated with increases in total annual water flows. In general, so long as infiltration is not impaired, the increase in water flows is proportionally greater in the dry season (baseflow or low flows). There is no documented case where tree planting or reforestation has been associated with an increase in dry season flows. *These findings suggest that upstream tree planting is not likely to increase dry season flows in the Cidanau catchment.*

Surface erosion: Surface erosion is low under natural forest, the fallow phases of shifting cultivation, plantations and tree gardens, and slightly higher under tree crops with mulch, the cropping phases of shifting cultivation and intercropped young forest plantations (taungya or tumpang sari). Surface erosion is dramatically higher – by factors of 10 to 100 – under clean-weeded tree crops and in forest plantations where the litter has been removed or burned. *These findings suggest that specific land management practices, particularly whether or not a layer of undergrowth or litter is maintained, will be more important in the prevention of soil erosion (and hence sediment loads) than whether the overhead plant cover is a tree crop or an annual crop.*

Gully erosion and mass wastage: The ability of vegetation to limit erosion from active gullies is limited relative to mechanical interventions such as check dams, retaining walls and diversion ditches. Tree cover does not influence the impact of deep-seated (greater than 3 m) landslides. *These findings suggest that tree planting will not be sufficient to prevent gully erosion or more severe erosion events.*

Sediment loads: Undisturbed forest yields little sediment. Disturbance is associated with large increases in sedimentation. Logging activities tend to cause peaks in sedimentation until re-vegetation occurs, whereas more serious disturbances such as road building, mining and (particularly) urbanisation have correspondingly larger impacts. In large catchments, there may be a long lag between changes in land use and changes in sediment loads, because of the large storage of sediment within the drainage system. *These findings suggest that the impacts of tree planting on sediment loads may be low relative to other features of the landscape, such as roads and residences, and that effects of land-use changes on sediment loads may take considerable time to be detected.*

Overall, the findings of Bruijnzeel's comprehensive review indicate that although trees may bring multiple benefits to the local environment, tree planting cannot be considered either necessary or sufficient to bring about the desired impacts on dry season flows and sediment loads downstream. Other changes in management of the landscape, particularly in the built environment, are likely to have important impacts on downstream water quality and water flows (White 2003; Yoshino and Ishioka 2005). Positive interventions may include changes in practice at the level of farmers' fields, as discussed in the next section.

Civil engineering

The environmental service contracts do not include targets or indicators for conservation techniques other than tree planting, but building terraces, raised beds and other field engineering works are considered a useful add-on to tree planting in the reduction of soil erosion. Farmers, however, are fairly reluctant to undertake such measures in their own fields. Even in a suggestive questionnaire survey, only about half of interviewed farmers agreed that soil conservation techniques had either environmental or economic advantages. Tellingly, in Brantas those farmers who do choose to terrace dryland fields say that they do so because of family traditions, not as a result of government or other external programmes. Similar reluctance to invest in governmental watershed management programmes has been found among Javanese fish farmers (Gunawan *et al.* 2004).

Nonetheless, farmers in Cidanau did respond to training in terracing from the Land Rehabilitation and Soil Conservation Office for the sub-watersheds of Ciujung and Ciliwung in 2005. A baseline survey in 2004 found that the only conservation technique practised in Citaman in 2004 was raised beds, whereas in Cibojong no engineering techniques were used. A repeat survey in 2006 found half of the steep dryland fields in Citaman now had terracing and a few farmers in Cibojong had also introduced raised beds or terraces. Farmers continue to consider terracing in steep upland fields to be far too costly.

Upstream water management

Downstream water flows and quality may be the primary concern to buyers of upstream land-use changes, but to farmers at both the Brantas and Cidanau sites, it is local water supplies that are the key challenge. According to the local communities at the two Brantas micro-sites, the volume of water from the forest springs that they use to supply village needs has decreased by about 50% over the past decade. They attribute this change to degradation of the forest on state forest land, particularly the planting of pines for timber. Hence, as an outcome of the payments for environmental services project, these communities have successfully set up a community management regime for the village springs that lie within



New water meter in Tlekung Village, Brantas. Villagers have installed water meters to manage local distribution equitably.

the state forest area (as described above). Notably, communities at Brantas also continue social systems for water management, *Bersih Desa* and *Gugur Gunung*, which involve a mix of rituals and actual clearing of springs and water channels.

In Citaman Village at Cidanau, the farmers' group has elected to invest some of its payment to rehabilitate the piped line water supply, through which water is abstracted to the isolated upland hamlets of Sibopong Landeuh and Girang where some members live. Residents have subsequently established a drinking-water users' association, which has set out rules for distributing water among households. This association has turned out to be a good arena for local people to develop a system of mutual help and self-reliance to maintain a sustainable supply of water. Regular collection of a service fee now funds operation, maintenance and improvement of the water infrastructure.

The farmers' group of Tlekung Village at Brantas has taken local formalisation of water management one step further through a successful campaign for efficient and equitable water use that has led to installation of water meters for households supplied by the local spring. Users now pay a service fee that is utilised locally to maintain pipes, taps and meters. This is a popular intervention among villagers, partly because water supplies are now better, with less water being wasted and a fair rotary system for agricultural use, and partly because they believe that monitoring of their use of water from the spring will give them a strong defence against competing users (for example if a bottled-water company tries to take over their spring, as has happened in other villages).

3.4 Governance opportunities, impacts and limits

New institutions: power versus flexibility

The central question about the impact of the new payment mechanisms on governance is the extent to which the way decisions on watershed management are made and, critically, who makes those decisions, has changed. Although the payments for environmental services schemes have certainly not brought about revolutionary change in water and land governance, there has been instructive institutional development, both at the micro-site level (as discussed in this sub-section) and at higher levels (as described in the next sub-section).

Community-level organisations with a dedicated function – such as irrigation management groups or marketing groups – are common in Java. Farmers at the various micro-sites were quickly willing and able to establish groups to manage the environmental service payments, complete with elected officers and written

constitutions. On the other hand, farmers in all villages were reluctant to go through the process of formal registration that would allow their group to hold a bank account and function as a legally recognised body able to negotiate, own property and take legal action on behalf of the collective. Farmers wish to avoid formality because of the associated burdens of administrative duties, too many rules, and the threat of extra surveillance by governmental agencies. Historically, formal, registered organisations have been mechanisms for top-down control. One participant voiced the fear that the farmers' group would turn into 'a detention that confines us from moving freely'.

This preference for flexibility over formalisation is understandable, but does reinforce the lack of capacity among farmers' groups to operate as equals within the framework of environmental service payment schemes. Companies that buy environmental services are unable to make direct financial transfers to the providers of the services if those providers do not have a bank account. The consequence has been the reliance on financial intermediaries (YPP in Brantas and the Ad Hoc Team in Cidanau), which have gone beyond financial management functions to much more powerful roles as negotiators of interests between buyers and sellers. In these schemes, buyers have set payment levels, based on the total amount they are prepared to spend. Contracted land-use interventions have mainly been decided by buyers, financial intermediaries and facilitators.

Farmers' groups, the sellers of the services, have so far had little power to participate in or influence these negotiations. As well as lack of information and experience, their bargaining power is low because they have little to withdraw from the deal if the buyer does not meet their terms. Under the pilot scheme, the buyer can simply move elsewhere, though this would not be possible if the scheme were more geographically widespread. The bargaining position of farmers is not helped by local constraints, such as the land conflict at the first choice micro-site adjacent to the arboretum in Brantas, which can be serious barriers to development (or survival) of environmental service payment schemes.

The challenge is to transfer authority and build capacity of farmers' groups without conferring excessive formality. The iterative 'action-learning' process is proving useful in this regard at both Brantas and Cidanau, building trust over time. Some specific processes that have worked are: (1) direct co-budgeting sessions between farmers and PJT1 in Brantas; (2) strengthening the institutional basis of the groups through training and moving discussion beyond administration of the payments to broader community concerns in Cidanau; and (3) farmer-to-farmer visits between sites.

Building broader coalitions

A major challenge to payment mechanisms for environmental services is that they required synchronised uptake and action by a wide set of stakeholders, including buyers, sellers, facilitators and the decision makers in government and the private sector who provide appropriate policy environments. The national and local facilitators of the environmental service payment schemes used several strategies for creating momentum through networking and sharing of lessons. Activities included cross-site visits by policy makers, farmer-to-farmer visits, a national learning network, seminars for specific stakeholder groups (for example chief executive officers of major water-using companies) and public conferences. The success of these approaches is shown by the subsequent stream of interest. For instance, the farmers' group in Tlekung has been so inundated by requests to visit that they are introducing a charge to visiting groups to cover their time and expenses.

Farmers also see coalition as an important means of enhancing their impact and voice. Aware of the huge size of the Brantas catchment, and spurred on by (non-project) training in community organisation, several community groups across the catchment have come together to form an association, *Serikat Petani Hulu DAS Brantas* (Upstream Brantas Farmers' Association). Establishment of the association reflects the solidarity among community groups, which include farmers' groups, forest management groups, forest village partnership organisations, irrigation water-users' associations, domestic water-users' associations, and youth groups. The original discussion point of the association was water politics, looking into the links between global demand and local supply, so it is hoped the association will see value in implementing upstream conservation practices, particularly through environmental service payments.

The ease with which farmers have associated across scale is not yet seen among the private sector or government agencies. At both the Brantas and Cidanau sites, the companies with the mandates to manage water distribution, PJT1 and KTI, have acted directly on behalf of the many industries to which they distribute water. The downstream industries have not been proactive in calling for, or attempting to shape the nature of, these transactions, though at the Cidanau site they have indicated a willingness to contribute towards paying for environmental services (van de Sand 2004). At the same time, government staff who are engaged in, or following the progress of, the schemes have commented that it is difficult to embed the lessons learned into their policies and programmes without a clear mandate from higher echelons within their departments. Those higher echelons are meanwhile waiting for demonstrable success before giving wide mandates to put resources into putative environmental payment mechanisms.



Tree nursery at Brantas. Farmers have found that locally reared seedlings do better than those purchased from nurseries further afield.



4 Conclusions

4.1 Lessons learned

Entry point for sustainable water management

One of the most practical lessons from this project is that regardless of success or failure of actual payment mechanisms, payments for environmental services have proven extremely valuable in Indonesia as an entry point to invite stakeholders to think and take actions towards sustainable and integrated watershed management. Stakeholders from all kinds of backgrounds – including small-scale farmers, executives in large industries, parliamentarians and technical staff in government – find the concept of environmental service payments intriguing and attractive. The concept of environmental service payments was the seed around which the FKDC watershed forum at Cidanau crystallised. Efforts to establish similar forums in other regions of Indonesia may be an excellent vehicle for stimulating multi-stakeholder decision-making processes on management of water resources and watershed environments. One of the weaknesses of the international theoretical concept of payments for environmental services is that they constitute a system for managing supply of services, without any attention paid to the management of demand. Indonesian stakeholders have been keen to apply payment schemes within a broader understanding of water services and water use. Discussing water conditions in the village proved to be the best entry point for local involvement in and understanding of upstream-downstream interactions. Villagers have felt it important to manage local consumption, for example by water metering. They are also open to making plans for provision of the services that produce higher water quality and quantity for downstream users.

Moving beyond established roles

Fundamental changes in how various stakeholders see their own roles, rights and responsibilities are needed for payments for environmental services to become widely accepted practice in Indonesia. At present, all of the key groups of stakeholders have legitimate doubts. Private-sector water users are unsure about environmental service payment schemes because they already pay water taxes, of which a proportion goes to environmental protection. Farmers fear that payments for environmental services are just another project that will try to force uneconomic tree planting on them which will then die out once funding is withdrawn. Government departments are concerned that environmental service payment schemes will either divert their budget allocations and power, or else increase government duties (facilitation, monitoring, enforcement, information delivery,

conflict resolution) without any extra resources to cover these costs. What all sides need is an opening of policy space for government to act and be understood as an enabler and facilitator, providing the context and conditions for payments for environmental services, rather than an enforcer and regulator. In turn, buyers and sellers of environmental services need to be able to make their own flexible deals within these broad sets of conditions, within a model of adaptive management.

Trust building and transaction costs

Building trust is a large part of the process of developing durable human transactions, including those between sellers and buyers of environmental services. How to facilitate and achieve synchrony of intentions and of actions among stakeholders – at a sufficiently early stage of the process – is a key challenge. Sometimes compromises accelerate this development. For example, although a direct financial transfer from buyer to seller might be seen as the ideal in an efficient environmental service payment scheme, this project found that indirect payment through an intermediary – whether it be the facilitating NGO YPP at Brantas or the multi-stakeholder watershed forum at Cidanau – functioned as an alternative means of establishing an institution that all parties would trust. Clearly a credible and experienced intermediary organisation has an important role to play in the course of designing and implementing an environmental service payment scheme; facilitation is an intrinsic component of a functional scheme. However, even with careful planning and cost-saving, effective facilitation does not come cheaply. At Brantas, the cost of facilitating the transaction was more than seven times the actual environmental service payment from PJT1 to the farmers' groups. And this figure refers only to the spending by YPP: it does not include the considerable inputs by the project team at national level, or the bulk of the transaction costs incurred by farmers, by the buyer PJT1 and by other stakeholders such as the various spin-off partners who supported the scheme. Spending on facilitation at Cidanau was similar, but from a greater variety of funding sources. Of course, transaction costs would be expected to decline with time as experience and scale increase, but it is unlikely that the full costs will be internalised within the next year.

Scaling up and out

Large-scale land-use changes are likely to be needed to achieve changes in water quantity and quality at the scale of the whole watershed. Constraints to the required level of scaling up include the small size of individual farmers' plots (which increase transaction costs and make it less likely that the payments to individual farmers will be sufficient to provide incentive for land-use changes) and the lack of cooperation among downstream buyers (in bigger watersheds, prevention of freeloading is a huge challenge). Some of the successes of pilot schemes have been to build social

capital and visibility. There would be fewer such opportunities at a larger scale. But there are also clear opportunities for scaling up, over the whole of the catchments included in this study, and scaling out to the broader national level. Expansion of functioning environmental service payment schemes needs to happen through three mechanisms: public policy, alternative finance and information sharing. Views of private sector buyers at the sites and in the national learning network suggest that an enabling legal basis for payments for environmental services is essential for a country with such a strong tradition of regulation. Additionally, alternative sources of finance, such as government-managed funds and corporate social responsibility budgets could usefully support emerging payment schemes. Interest in payments for environmental services is already high in Indonesia. Stakeholders from upstream farming communities, the private sector and government have all come forward of their own accord to visit sites and share experiences on payments for environmental services. Scaling up and out will happen not just through government or businesses but also through the sellers of environmental services, such as the self-formed farmers' association *Serikat Petani Hulu DAS Brantas* (SPH) at Brantas spreading impact by farmer-to-farmer influence, and the village Sukomulyo taking up project activities with neither funding nor a field facilitator.

4.2 Policy recommendations

Payments for environmental services are voluntary systems that work as a supplement to regulation. In this context, government policy is about creating the right kinds of conditions for environmental payment schemes to emerge, rather than about requiring companies and communities to enter into payment agreements. A major difficulty in Indonesia, as in other countries, is that many of the regulations that environmental service payment schemes might supplement are not well enforced. For example, logging and clearance for agriculture within conservation forest are widespread. Many people argue that these problems are not just problems of enforcement, but of fundamental governance issues of how and by whom official land-use decisions are made in the first place. For environmental service payments to work, therefore requires much broader improvements in the governance of forest, water and land.

With these issues in mind, participants in the project, including the national learning network, developed two principles for policy development to support payments for environmental service schemes, applicable at national and local levels. The first is that environmental service provision and associated forest protection should be a central theme in government planning processes and regulations. This requires, for example, a re-orientation of the Forest Law 41/1999 (and its revised Forest Regulation 30/2002) away from the current focus on utilisation to a clear message



Farmers' group office, Bendosari Village, Brantas. Active sharing of information among farmers and visitors is a key part of the environmental service payment scheme.

of provision of economically valuable services through conservation. The second is that local level multi-stakeholder processes should be given greater support to understand and initiate locally appropriate systems for financing watershed management. In other words, the message and mandate given by central government should not be to implement environmental service payment schemes, but to have the freedom to innovate locally.

The experiences at Brantas and Cidanau also give rise to several more specific recommendations for different areas of policy, as listed below.

Strategies and processes

- Identification and development of further sites where environmental service payments may offer solutions to current water problems.
- Replication of the Cidanau forum on watershed management (FKDC) at other locales, as a means of promoting open but semi-formal debate and innovation in catchment management.
- Enrichment of pilot projects to develop best-bet approaches and models.

Regulations and policy statements

- Development of institutional guidelines and a clear legal basis for intermediary financial bodies, which would enable other buyers of watershed services to enter the frame, such as government agencies that are only permitted to invest their budgets in legally constituted bodies.
- Support of innovative approaches for management of state forest land, such as the Brantas model of community-based protection of forest areas around springs.
- Development of, and increased publicity about, existing fiscal incentives (tax breaks) for the private sector to invest in conservation.

Provision of services and information

- Provision of support services to farmers' groups and other community-level organisations that provide environmental services, for example links to credit and other spin-off partnerships, including training opportunities.
- Greater publicity and strategic communications, particularly at local levels, to expose problems of watershed degradation and its downstream effects, to raise awareness of the general public and to drive the willingness of water users (mainly for commercial purposes) to invest in watershed protection services.
- Equally strong advocacy and information sharing on solutions to these problems, particularly current best practice and lessons learned from experience.

4.3 Final word

The idealised model of an environmental service payment system entails a voluntary transaction between buyer and seller to secure a specific environmental service on a quid pro quo conditional basis (Wunder 2005). The emerging schemes at Brantas and Cidanau demonstrate that a hybrid model, aiming at both social and environmental goals, is a workable possibility, at least at this early stage of learning and adaptation. A scheme to deliver primarily environmental aims would, of course, evolve differently from a scheme to deliver poverty reduction. In the Indonesian context, however, stakeholders in the schemes tend not to have objectives that are strictly delineated between environment on the one hand and local livelihoods on the other. Companies are willing to invest in environmental service payments not so much because they see these as cost-effective means to improve and maintain water flows and quality, but rather because they wish to invest in a broader package of benefits to conservation and society. Farmers similarly are concerned not only with improving their cash incomes, but also with enhancing water flows and water quality in their own areas (as well as other environmental benefits). Further cycles of action, reflection and adaptation in the schemes will demonstrate the durability or otherwise of this kind of hybrid model.

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Indonesia, like many countries, faces growing problems with water. Concerns include floods, low dry-season flows, sedimentation, contamination from run-off, and rising demand among competing end-users. Concerned suppliers and users of water at various localities around Indonesia are now experimenting with new approaches for managing watersheds. One such approach is payments for environmental services, in which water users compensate watershed land managers for land management that protects or improves water quality and flows.

This report describes action research in Indonesia to take forward local environmental service payment initiatives at two sites, Brantas and Cidanau, and to spread learning more widely among interested people across the country.

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