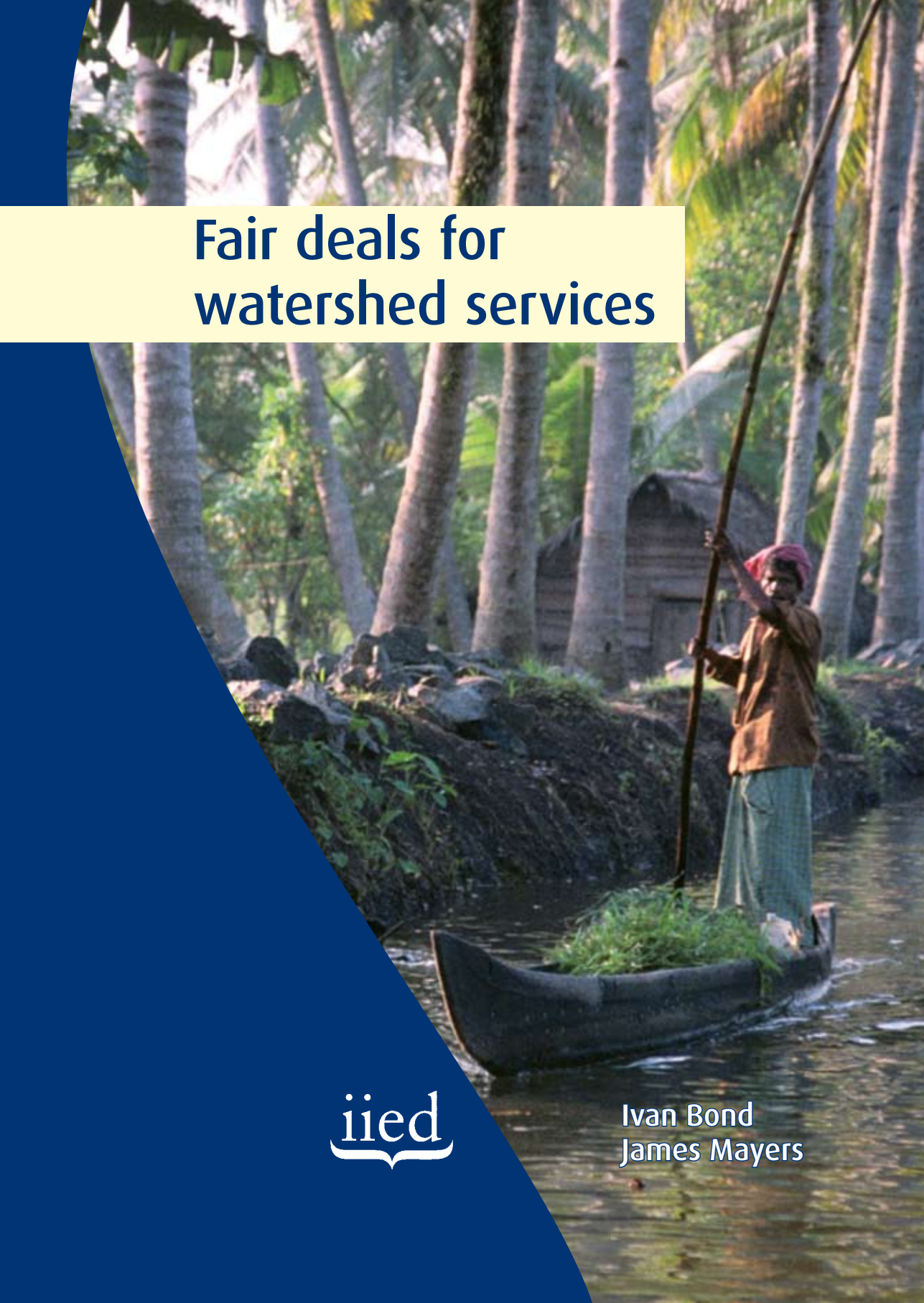
Fair deals for watershed services



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James Mayers

Fair deals for watershed services

Lessons from a multi-country action-learning project

Ivan Bond
James Mayers

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Acronyms and abbreviations

CAAS	Chinese Academy of Agricultural Sciences
CANARI	Caribbean Institute of Natural Resources
Cat-Del	Catskills-Delaware
CAWMA	Comprehensive Assessment of Water Management in Agriculture
CBNRM	Community-based natural resource management
CBO	Community-based organisation
CDM	Clean Development Mechanism
CIFOR	Center for International Forestry Research
CNFL	Compañía Nacional de Fuerza y Luz (private company, but majority-owned by the state utility company, Costa Rican Institute of Electricity)
CSIR	Council of Scientific and Industrial Research (South Africa)
DFID	Department for International Development (UK)
DWAF	Department of Water Affairs (South Africa)
ES	Environmental services
ESPH	Empresa de Servicios Publicos de Heredia (Public Utilities Company of Heredia)
EU	European Union
FKDC	Forum Komunikasi DAS Cidanau (Cidanau Catchment Communication Forum)
FONAFIFO	Fondo Nacional de Financiamiento Forestal (National Forestry Financing Fund)
FRP	Forest Research Programme (formerly of DFID)
GDP	Gross domestic product
GEF	Global Environmental Facility
Ha	Hectare
HPEDS	Himachal Pradesh Eco-Development Society
ICDP	Integrated conservation and development project
IIED	International Institute for Environment and Development
IPCC	Intergovernmental Panel on Climate Change
IWRM	Integrated (land) water resource management
km	Kilometre
PT KTI	PT Krakatau Tirta Industri (Krakatau Water Industry, Indonesia)
LCA	Lake Conservation Authority
LP3ES	Lembaga Penelitian, Pendidikan dan Penerangan Ekonomi dan Sosial (Institute for Social and Economic Research, Education and Information, Indonesia)
m	Metre
MA	Millennium Ecosystem Assessment

MDG	Millennium Development Goal
MES	Markets for environmental services
MW	Megawatt
NGO	Non-governmental organisation
NTFP	Non-timber forest product
O&M	Operations and maintenance
PES	Payments for environmental services
PDAM	Perusahaan Daerah Air Minum (District Domestic Water Company, Indonesia)
PJT1	Perusahaan Umum Jasa Tirta 1 (Brantas River Basin Operator, Indonesia)
PLN	Perusahaan Listrik Negara (National Electricity Company, Indonesia)
PSA	Pago por Servicios Ambientales (Payments for environmental services, Costa Rica)
PSAH	Pago por Servicios Ambientales Hidrológicos (Payment for Hydrological Environmental Services Programme, Mexico)
PWS	Payments for watershed services
RDC	Rural district council
REDD	Reduced emissions from deforestation and forest degradation
Rp	Rupee (India)
SLCP	Sloping Lands Conversion Programme (China)
TWCG	Talvan Water Catchment Group
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Fund
USFWS	United States Fish and Wildlife Service
WASCO	Water and Sewerage Company
WfW	Working for Water programme (South Africa)
WHO	World Health Organization
WII	Winrock International India
WWF	World Wide Fund for Nature
YPP	Yayasan Pengembangan Pedesaan (Rural Development Foundation, Indonesia)
ZEF	Zentrum für Entwicklungsforschung (Centre for Development Research, Germany)

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Country action-learning reports and an international review developed by the above-mentioned partners are companion volumes to this synthesis and are cited as follows:

Asquith, N. and M. Vargas (2007) *Fair Deals for Watershed Services in Bolivia*, Natural Resource Issues No. 7. IIED, London.

McIntosh, S. and N. Leotaud (2007) *Fair Deals for Watershed Services in the Caribbean*, Natural Resource Issues No. 8. IIED, London.

Munawir and S. Vermeulen (2007) *Fair Deals for Watershed Services in Indonesia*, Natural Resource Issues No. 9. IIED, London.

Agarwal, C., S. Tiwari, M. Borgoyary, A. Acharya and E. Morrison (2008) *Fair Deals for Watershed Services in India*, Natural Resource Issues No. 10. IIED, London.

Porras, I., M. Grieg-Gran and N. Neves (2008) *All that Glitters: A review of payments for watershed services in developing countries*, Natural Resource Issues No. 11. IIED, London.

King, N., R. Wise and I. Bond (2008) *Fair Deals for Watershed Services in South Africa*, Natural Resource Issues No. 12. IIED, London.

Li, X., L. Jin, T. Zou and I. Bond (2007) *Payment for Watershed Services in China: The role of government and market*, College of Humanities and Development (COHD) of the China Agriculture University (CAU), Beijing.

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Executive summary

Payments for watershed services – clear theory, fuzzy practice

Payments for ecosystem services make good sense. People who look after ecosystems so that others can benefit from them should surely be rewarded in some way by the beneficiaries, shouldn't they? In the case of watershed ecosystems, downstream beneficiaries of wise upstream land and water stewardship should compensate these upstream stewards. These 'payments for watershed services' (PWS) should contribute to the costs of watershed management and, if upstream communities are also characterised by poverty, these payments should contribute to local development and poverty reduction as well. All this seems sensible, especially in the light of increasing degradation of many of the world's watersheds.

So much for the idea, what about the reality? Are lots of payments being made? Are they an effective tool for shifting land and natural resource management towards sustainability? And, with experience telling us that markets are rarely designed to conserve the environment or to address poverty and inequality, what magic is involved in making payments for watershed services do both?

Debates about both conservation and development have seen a wave of excitement about payments for watershed services in recent years. But on the ground an equivalent surge of action is harder to see. There has been a lot of talk about ideals and considerable extrapolation of conclusions from a few case studies, mostly from developed or middle-income countries. There have been fewer efforts to initiate and concertedly track the complex business of developing payments for watershed services in low-income countries.

However, several projects and programmes have emerged over the last few years to test the efficacy of payments for watershed services as both a development and conservation intervention. Amongst them, IIED and its partners have been building on earlier international case study work to set up new PWS schemes – to 'learn by doing' and to improve our understanding of the opportunities and the challenges.

Exploring real-world schemes – action-learning and global review

The first phase of this work began in 2001 with diagnostic studies in India, South Africa, Indonesia and four Caribbean island states. An implementation phase started in late 2003 and involved partners and sites in India, Indonesia, China, South Africa, Jamaica, Saint Lucia and Bolivia. This action-learning focused on the following watersheds:

- The Bhoj Wetlands in Madhya Pradesh state, and Bhodi-Suan and Kuhan in Himachal Pradesh state, India.
- The Brantas River in East Java province and the Cidanau River in Banten province, Indonesia.
- The Sabie-Sand catchment in Mpumalanga province and the Ga-Selati River in Limpopo province, South Africa.
- The Buff Bay/Pencar catchment, Jamaica and the Talvan catchment, Saint Lucia.
- The Rio Los Negros watershed, Santa Cruz department, Bolivia.
- In China, the work focused on local and national processes rather than on developing payments for watershed services at particular sites.

The above ten sites were selected by the in-country teams on the basis that they offered good chances of developing payment mechanisms for watershed services. Over three years the teams worked with partners and stakeholders to develop payment mechanisms. In three of the sites (Kuhan, Brantas and Cidanau), new payment mechanisms between upstream land users and downstream water users were developed. In Bolivia, the existing payments scheme on the Los Negros was strengthened through its work with the project.

IIED also conducted a global review of 50 cases of payments for watershed services in developing countries (of some 123 initiatives initially identified, 73 were excluded from the analysis either because they did not fit the PWS definition used or because insufficient information could be found on them). This review updates and builds upon IIED's 2002 review of PWS schemes (alongside payments schemes for other ecosystem services), *Silver Bullet or Fools' Gold?* The new review found that of the 42 initiatives analysed in 2002, only 15 can be considered still active, while a further three remain at the proposal stage, and 21 (50 per cent) have been abandoned or are of uncertain status. On reflection, the remainder of the sample (three) were reclassified as marginal or borderline PWS projects.

Key questions – and answers from the evidence so far

Some of the main findings from the work follow – presented in the form of questions and answers using the evidence we have:

Can payments for watershed services reduce poverty and improve livelihoods?

Yes, but the number of cases in which livelihoods have clearly been improved is small. We conclude that:

- There are better ways of reducing poverty through than through PWS, such as improving education, health and nutrition.

- There are significant and positive indirect effects of PWS – particularly in building social capita in poor communities.
- There is little evidence of PWS doing any harm to poor people.
- Effective targeting can make PWS programmes more effective at alleviating poverty.

Payments for watershed services should not be considered as a tool for widespread use in reducing poverty in developing countries. While evidence from some schemes shows modest increases in household incomes from PWS, the effects cannot be considered to represent substantial reductions in poverty. Our evidence does, however, suggest that indirect effects of PWS development – such as improved social cohesion, community confidence, and new entrepreneurial relationships – have substantial potential to reduce poverty, yet these effects are rarely specific to PWS and could potentially be generated through alternative actions.

What has been the impact of payments for watershed services on water and land management?

Impact has been modest to date. Environmental impacts causally attributable to PWS schemes appear to be limited. We conclude that:

- The relationship between land use and water is complicated and site specific.
- Even when the scientific evidence is weak locally logical and fair action may still be feasible.
- Targeting environmentally sensitive or critical areas within watersheds will increase the effectiveness of PWS mechanisms.

There is little evidence from the action-learning sites to suggest that payments for watershed services have had a significant effect on land and water management – although the schemes are generally still in their infancy and at pilot scale (indeed our review work suggests that about 50 per cent of new PWS initiatives fail). While some schemes around the world are promising in this regard, our review work generally confirms this picture of very limited environmental effects. In this context, it is unsurprising that perceptions about watershed service provision are, at best, only one of many factors involved in decisions about upland land use. Interrogation of these perceptions may be a key additional function that PWS schemes look to provide.

What factors affect supply of watershed services?

Land users may change their behaviour in response to several factors, only some of which can be influenced through PWS schemes. We conclude that:

- Awareness of market opportunities is low – third party facilitators can play a key role in introducing PWS as an option.
- Payments need to be big enough relative to other opportunities to create a real incentive for change.
- Cultural factors such as resistance to value ecosystem goods and services can constrain the development of PWS mechanisms.

To change farmers' behaviour, payments for watershed services must be competitive with existing and perceived future net returns to land and labour. However, insufficient connections between suppliers and users of watershed services, coupled with social resistance to payment mechanisms in some contexts, are major barriers that intermediary organisations often find difficult to overcome.

How much demand is there for watershed services?

The demands on land, water and other resources within watersheds are growing, and increasingly competing with each other. We conclude that:

- Private sector demand for watershed services is still low.
- Large publicly funded schemes as in China or South Africa can both constrain or stimulate privately funded schemes.

In nearly every watershed, in nearly every country, water quality and quantity are deteriorating because of increasing demands and changes in land use. The concept of someone paying for ecosystem services is relatively new, and the existence of a compelling 'business case' for them to do so is relatively rare. While demand in Africa remains low, there are considerably more schemes in Latin America and Asia.

What kinds of payments are being made in emerging PWS schemes?

There is considerable diversity in the method and frequency of payments in emerging PWS schemes – from cash to in-kind payments, from one-off to regular payments. We conclude that:

- Diverse payments and payment mechanisms are a response to local conditions and watershed values.
- Differentiated payments within a scheme are both possible and practical.
- Prices for watershed services are yet to be determined by 'the market'; in most cases prices are set by administrators and intermediaries.
- One-off payments to help farmers move from one technology to another may be more realistic than in-perpetuity payments.
- A wide variety of other incentives (i.e. tax breaks, free seedlings) for watershed management are in play that may one day lead to PWS.

There are strong regional differences in the prevalence of PWS schemes between Latin America (expanding number and scale of PWS schemes), Asia (experimenting), and Africa (schemes are still to be developed). Schemes are also strongly differentiated between local users and national or government-funded programmes. Some programmes address water quality, others tackle water quantity problems, and others 'bundle' different services. Private landholders are the predominant suppliers of watershed services in user-based and national programmes, while communal landholders tend to be under-represented. Funds and transfer payments are handled by intermediaries in most cases, sometimes using dedicated trust fund arrangements, and the trend appears to be for simple payment structures. Asymmetries in power, resources and information between stakeholders suggest that efficient price determination mechanisms are unlikely to develop in the near future.

What role does government play in the development of payments for watershed services?

Government's role is at best enabling, at worst obstructive – but it is essential. We conclude that:

- Government legal and policy frameworks shape what is possible and not possible in PWS schemes.
- Government policy is frequently fragmented, often perverse and often based on very simple and hydrological models.
- Government's role in defining and upholding land ownership is particularly critical.
- Balancing regulation and incentives, equity and efficiency, is easier said than done.

Some governments, like those in China, Costa Rica, Mexico and South Africa, become buyers of watershed services; all governments, through policy and legal frameworks, are critical for shaping how PWS schemes develop. Land and resource tenure is particularly important – but much policy and law is contradictory or ineffective. PWS protagonists may be able to help governments consider the appropriate balance between efficiency and equity in policy and law.

How can trust and transaction costs be optimised to make PWS work?

Trust and transaction costs are the 'make or break' for PWS schemes. We conclude that:

- Using existing institutions can reduce transaction costs.
- Neutral intermediaries fulfil multiple roles in developing and maintaining PWS relationships.
- Trust between stakeholders reduces transaction costs – but it is hard to build and easy to lose.

Existing local institutions are crucial but are often lacking and are rarely a panacea for existing land and water problems. Developing, implementing and monitoring PWS mechanisms can lead to high transaction costs that undermine viability, compromise efficiency and will jeopardise long-term sustainability. Whatever route is taken for the management of watersheds, maintaining trust amongst the key stakeholders is the key to keeping transaction costs low and manageable.

Ways forward

Looking ahead, we suggest action is best concentrated in the following main ways:

Keep the experiments coming, keep learning from them, and keep adapting

PWS schemes are difficult to set up, and they should not be seen as a blueprint for conservation or poverty reduction. Yet there is strong justification for their further exploration and development. Adaptive management of PWS approaches is needed – maintaining a flexible approach to implementation and ensuring that work on PWS recognises what can be learned from experience to date. Such adaptive approaches are best built on site-specific approaches to assessment that identify ecosystem functions that, in turn, support provision of locally valued ecosystem services.

Expect and prepare for negotiation, and a blend of incentive and regulation

Buyers, sellers and intermediaries in PWS schemes have unequal powers and abilities to generate and use evidence. As in any field where uncertainty and complexity prevail, actors need to work together, to treat each others' views as legitimate, to expect change, and to keep questioning experience. It may be possible in some contexts for PWS schemes to develop without strong enabling regulatory frameworks and institutional cooperation. But at larger scales they can only serve effectively as components of diverse, and at best integrated, watershed strategies. It is only at smaller scales that causes and effects can be reasonably well understood and stakeholders can become directly engaged. Work at this scale may also develop the capacity to engage at larger scales in a way that is accountable to livelihood interests.

Ensure that capacity is built and returns to livelihoods improve

Negotiated and adaptive approaches will only be achieved if capability in a range of disciplines is steadily built. It is clear that in many attempted PWS schemes critical expertise, notably in hydrology, is very thinly spread and in some cases absent. Initiatives to make relevant expertise more accessible to those engaged with watershed issues, and to develop credible rapid assessment methods and other negotiation support tools, are sorely needed. In contexts of poverty, the need for strategies to improve the links between PWS and improved livelihoods is pressing.

These include: better targeting of the poorest households; reducing the barriers to entry; and creative means of involving landless, often the poorest, households.

Take the lessons from watersheds into the climate change arena

With climate change becoming the top global environment and development issue, and with the spotlight turning anew to land use and deforestation, new imperatives and opportunities have emerged for PWS experience. Much like PWS, payments for reduced emissions from deforestation and degradation (REDD) in developing countries are conceptually simple but will be challenging to implement. However, sensitively implemented, they could represent long-term streams of finance to ecosystem services that vastly exceed any previous financial transfers made through development assistance channels. But there are many hurdles between conceptual appeal and effective implementation. There are questions of governance, and in particular just how appropriate it is to insist on conditionality or contingency in payments for reduced deforestation. Other issues that are likely to be contentious are monitoring, reporting and verifying emission reductions, especially when the projects are operating at large scales in remote, sparsely populated areas. In parts of the world that will become more arid and climate stressed, REDD and related interventions will need to recognise, and be assessed for, their implications on all other ecosystem services, particularly water. A focus solely on emissions reduction and carbon sequestration could easily lead to interventions that ignore the multiple services and complexity of ecosystems and landscapes. Getting REDD wrong could be bad news for the environment and livelihoods; getting it right could greatly brighten the prospect of fair deals for watershed services.

Photo: Ina Porras

Growing assets: reforestation supported by a payments for environmental services scheme in Costa Rica

1 Introduction: the problem and potential of payments for watershed services

1.1 What this report is about

This report is about the complex business of trying to put a simple conservation and development idea into practice. The idea is that watershed degradation in developing countries might be better tackled than it currently is if downstream beneficiaries of wise land use in watershed areas paid for these benefits. There are some examples around the world of this idea being put into practice – this report reviews these and describes what happened when teams in six developing countries set about exploring how the idea works on the ground.

There are five sections in this report. The remainder of this introduction puts forward the problem addressed by the report and the potential of payments for watershed services in tackling it. Section 2 outlines the approaches taken in the project, the partners involved, the various case study sites and their biophysical, social, political and economic settings (further key facts about these partners and sites are outlined in Appendix 1 and 2 respectively). Findings to date from these sites are introduced and discussed in Section 3, which also summarises findings from an international review of cases of payments for watershed services. A summary of some of the lessons learned from experience is then offered in Section 4. Section 5 looks at the future for payments for watershed services and the links with climate change.

1.2 Problems with watersheds and dilemmas in conservation and development

Recent major global assessments of ecosystems and development present a mixed picture, but generally not a good one (Adams and Jeanrenaud, 2008). In its 2007 stocktake, the United Nations Environment Programme (UNEP) concludes that the general situation is 'continued overuse of the Earth's ecosystems and negative impact on the environment, as well as some progress in global policies to address major environmental issues' (UNEP, 2007). The World Wide Fund for Nature's (WWF) 'ecological footprint index' suggests that humanity's resource consumption and waste production exceeds the Earth's bio-capacity by about 25 per cent (WWF, 2006). The Millennium Ecosystem Assessment (MA) estimated that 15 of the 24 major ecosystem services that support humanity (through provision of fresh water, replenishment of fertile soil, or regulation of the climate for example) are being pushed beyond their sustainable limits or are already operating in a degraded state (MA, 2005).

Watershed ecosystems exemplify this situation (Box 1). Some promising trends were identified by the Comprehensive Assessment of Water Management in Agriculture (CAWMA, 2007) – pulling together in 2007 some five years of work by more than 700 scientists and practitioners from around the world. For example, land and water productivity has risen steadily, with average grain yields rising from 1.4 metric tons per hectare to 2.7 metric tons over the past four decades. Potential increases in yields are greatest in rain-fed areas, where many of the world's poorest people live and where managing water is the key to such increases. In facing the demands of a world population of 8–9 billion expected by 2050, with determined change there is real scope to increase production on many existing irrigated lands. There is also real potential in many areas for highly productive pro-poor groundwater use, e.g., in the lower Ganges of Indian subcontinent and parts of sub-Saharan Africa. CAWMA concluded that there is enough fresh water to produce food for all the world's people over the next half century, but also that failure to drastically improve the efficiency of water use in this period will mean that environmental crises will be experienced in many locations (Molden, 2007).

Huge gains have been made in meeting human needs through water resources development. Between 1990 and 2000, 1.2 billion people were supplied with both improved water and access to improved sanitation (WHO and UNICEF, 2006). This is a massive achievement, although population growth has diminished its impact, but reaching the 'second billion' is proving a harder and slower task – some 1.1 billion people still lack access to an improved water source and most of these people use about five litres of water a day – one quarter of the 20 litres now considered a minimum threshold and, increasingly, a basic human right, and one tenth of the average daily amount used in rich countries to flush toilets (UNDP, 2006).

At the same time, water resources development and other natural resource uses have themselves become direct drivers of ecosystem degradation, which is now being compounded in particular by climate change and nutrient pollution. Two major causes for concern stand out. Firstly, the gains from the exploitation of natural resources are unevenly distributed, while the costs of ecosystem change – including the loss of indigenous forests and the declining quality and amount of land and freshwater – have been borne disproportionately by the poorer sections of society (Bass *et al.*, 2005). Secondly, the reinvestment of wealth from exploitation of natural resources has not been sufficient for future generations to be able to adapt their way out of problems using improved technology (Arrow *et al.*, 2003). It is very clear that at the current rates of decline of ecosystem services and environmental degradation the Millennium Development Goals (MDGs) that underpin the global policy drive to eradicate poverty are unlikely to be achieved (UNDP, 2007).

Box 1

Poor people and watershed services – some numbers

Better links between land use and improved water quality and water quantity are an attractive proposition in a world where:

- **1.6 million children under five years of age die each year because of unclean water and poor sanitation.**
- **The Millennium Development Goal (MDG) of halving by 2015 the proportion of people without sustainable access to safe drinking water will be missed by 235 million people on current trends. To meet the MDG, 300,000 people need to be served each day, every day, from now until 2015.**
- **Over 4,000 litres of water is needed each day to produce enough food for a healthy diet for each person on the planet. A calorie of food takes a litre of water to produce. A kilo of grain takes 500–4,000 litres, a kilo of industrially produced meat 10,000 litres.**
- **Diseases and productivity losses linked to water and sanitation in developing countries amount to 2 per cent of GDP, rising to 5 per cent in sub-Saharan Africa – more than the region gets in aid.**
- **Water insecurity linked to climate change threatens to increase the number of people suffering from malnutrition by 75–125 million by 2080. In many sub-Saharan African countries, staple food production will fall by more than 25 per cent.**
- **According to the World Water Commission, more than half of the major rivers of the world are seriously polluted.**
- **Over 1.4 billion people currently live in river basins where the use of water exceeds minimum recharge levels, leading to the desiccation of rivers and depletion of groundwater.**
- **The number of people living in water-stressed countries will increase from about 700 million today to more than 3 billion by 2025.**
- **Investments in water and sanitation often have a high economic rate of return. For every dollar invested there is an economic return of eight dollars.**

Source: Falkenmark and Rockstrom (2005); IPCC (2007a); MAR7 (2005); UNDP (2006); WHO and UNICEF (2006); Prüss-Üstün *et al.* (2008).

Some ecosystems and the services that they provide are being degraded because nobody has an incentive to look after them.[1] This is because many ecosystem services are *positive externalities* (i.e. unintended and uncompensated benefits) and/or public goods (because they cost little or nothing to supply to additional users, but the cost of excluding those users is extreme) (Markandya *et al.*, 2002). Although ecosystem services are critical for life on earth they are not traded in markets and therefore have no observable price to guide their supply and demand. For this reason, central governments or local administrations have historically

1. The Millennium Ecosystem Assessment installs a broad definition of 'ecosystem services': the benefits people obtain from ecosystems. These fall into four main categories: provisioning services like food, water, fibre and energy (i.e. goods, products, resources); regulating services like climate and flood regulation; cultural services like aesthetics, spirituality, education and recreation; and supporting services like nutrient cycling and soil formation (MA, 2005). Meanwhile the literature on payments for 'environmental services' has tended to focus on the last three categories and exclude 'provisioned' goods and resources. From this point onwards in this report, however, the terms 'ecosystem services' and 'environmental services' are used interchangeably.

assumed responsibility for determining how such services should be managed, and have generally adopted a regulatory approach to this based on protection, restrictions, controlled access and limitations on use (Landell-Mills and Porras, 2002; Tietenburg, 2000; Engel *et al.*, 2008). While many areas of significant ecological importance, outstanding natural beauty and special scientific interest are being managed, as well as sites of interest to communities[2] the current rates of land-use change and environmental degradation outside of these protected areas and the resultant harm that is being caused to local livelihoods indicate that something is deeply wrong.

The dominant paradigm of the 20th century was to promote economic development over environmental concerns, the argument being that these would be resolved later. In the last two decades our understanding of complex links and feedback loops between poverty, land-use change and environmental degradation have improved significantly although they are still contentiously debated. However, the responses to the linked problems of ecosystem degradation and poverty have varied greatly: from dealing with poverty and conservation as separate policy realms to regarding poverty as a critical constraint on conservation; from insisting that conservation should not compromise poverty reduction to recognising that poverty reduction depends on living resource conservation. While both poverty reduction and conservation are diverse and complex, any proposed solution to these two challenges that does not recognise this complexity and inter-relatedness is likely to fail (Adams *et al.*, 2004).

Some of the first examples of attempts to improve incomes while conserving the environment were the integrated conservation and development projects (ICDPs) of the late 1980s and early 90s. In general, ICDPs did not live up to these expectations. Most failed to achieve either their conservation or their livelihood improvement goals (Barrett and Arcese, 1995, Ferraro and Simpson, 2002; Simpson and Sedjo, 1996). Community-based natural resource management (CBNRM) programmes, some of them offshoots of the ICDPs, have fared somewhat better because they have transferred greater ownership to local people (Hulme and Murphree, 2001). In some instances they have also succeeded in creating substantial direct and indirect livelihood benefits at both community and household level (Binot *et al.*, 2009).

A weakness in some of these programmes, however, is the absence of clear links between performance and benefits (Wunder, 2005). For example, in some southern African cases communities receiving wildlife revenues are under no contractual obligation to maintain wildlife habitat. The working assumption being that where

2. It is estimated that 19.7 million km^2 of land is currently under some form of protection (Adams *et al.*, 2004).

wildlife has a comparative advantage, communities will make a collective decision to manage it wisely (Bond, 2001). In the Namibian CBNRM programme, however, the formal registration of a conservancy binds the community into land-use and management plans (NACSO, 2006; Jones and Murphree, 2001). In return, the government legally empowers the conservancy to market and derive the benefits from wildlife leases. Other CBNRM programmes, such as CAMPFIRE in Zimbabwe, did have some conditions as part of the contract between rural district councils (RDCs), wildlife producer wards and tourism enterprises. However, for political reasons these conditions, particularly about land-use planning, were seldom enforced (Frost and Bond, 2008).

Photo: Ina Porras

Good plan, where's the action? Rhetoric exceeds reality so far in payments for watershed services

1.3 Payments for watershed services: the allure of a 'win–win'

For years, environmental economists have talked about correcting for the market failure inherent in the management of ecosystem or environmental services. For public goods this means internalising the costs and benefits of supplying the services (Barbier and Swanson, 1992). For land-based ecosystem services, this means that the beneficiaries of the service provide incentives or rewards directly to land managers for the services received. It also implies that the providers of the service have secure tenure over their land, which means that they will bear or internalise the long-term 'costs' of poor management. Generically, this approach has been termed 'payments for environmental services' (PES). The innovation and the characteristic that differentiates PES from previous paradigms or approaches is that the payments are conditional or contingent on changes in land use by the service provider. A useful, and increasingly widely accepted, five-clause definition

is provided by Wunder (2005) who proposed that a payment for environmental services is:

1. *a voluntary transaction* in which
2. a *well-defined environmental service (ES)* (or a land use likely to secure that service)
3. is being purchased by at least one *ES buyer*
4. from at least one *ES provider*
5. if, and only if, the ES provider ensures the supply of the ES (i.e. there is *conditionality*)

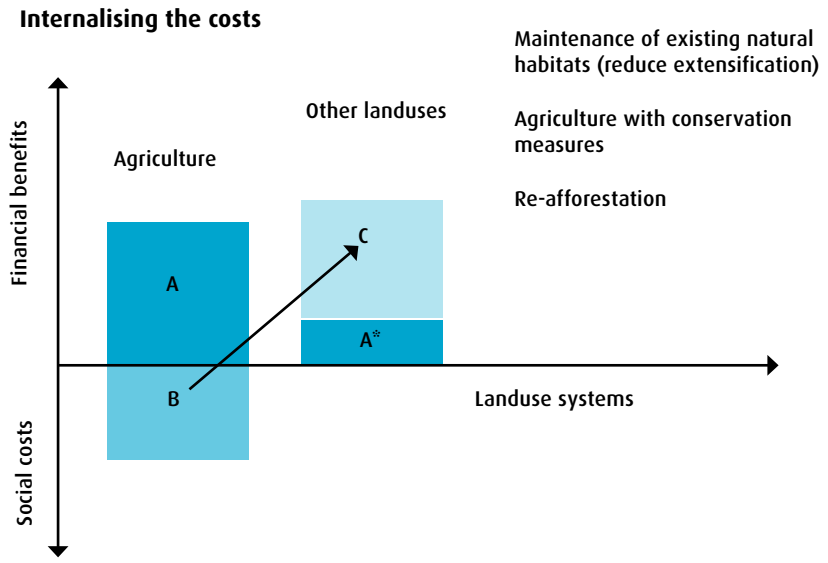
Each element of the definition is important since together they identify PES as a new approach, not simply an old one with a new label (Wunder, 2005). The *voluntary* nature of the transaction separates PES from the conventional command-and-control approach of many governments. *Clear definition of the ecosystem service* implies that the service can be measured, i.e. tonnes of carbon sequestered or the turbidity levels in water. Structuring the arrangement as a relationship between a *buyer* and an ecosystem service *seller* clearly defines the principles and counters the tendency for third parties to appropriate the financial benefits. The *conditionality* criterion (contingency) serves to separate PES from many other incentive-based resource management approaches. In its simplest form, it means that the payment will only be made when the providers of the service implement the agreed changes. It can be refined so that payment is scaled to performance.

Wunder freely acknowledges that this robust definition of PES severely limits the number of working examples to some experienced in developed economies, 'Costa Rica and a dozen other experiences, mostly in Latin America' (Wunder, 2005). Importantly, he also acknowledges that the terminology associated with markets and market-based interventions can also be a 'stumbling block' to new approaches in environmental management (Wunder and Vargas, 2005). To overcome anti-market sentiments in many Asian and South American countries, PES initiatives are using an alternative vocabulary such as 'compensations' or 'rewards' for ecosystem services. While the language is different the underlying principles are not – users of ecosystem services are paying/rewarding or compensating service providers. For the purposes of this report, however, we tend to draw on the much broader definition of PES and PWS that stresses the presence of a water-based externality being addressed by payments to land users from water users (see Porras *et al.*, 2008).

The International Institute for Environment and Development (IIED) undertook the first global review of emerging experience with payments for environmental services, examining them through the two lenses of environmental protection and poverty reduction. The 287 examples of services examined were all perceived to be linked to forests in some way and fell into four main categories: carbon sequestration and storage; watershed protection; biodiversity protection; and landscape beauty (Landell-

Figure 1

The logic of payments for watershed services



The logic of payments for ecosystem services assumes that current land-uses are the most profitable option available to the farmer (A) but that these result in some off-site costs being incurred (B).

The alternative landuse will only be more financially viable if the payments (A* plus C) raise the net incentive above the incentive for the current behaviour (A). Further, those suffering from the cost of the externality will only pay if this is a compelling option, i.e. cheaper than the current costs incurred (B>C).

Source: adapted from Wunder *et al.* (2008).

Mills and Porras, 2002). This work urged both optimism and caution about the 'win–win' potential of payments and incentive systems for environmental services and called for special attention to be given to the potential pitfalls as well as opportunities facing poorer groups.

Since 2002, the concepts, language and the 'markets' for ecosystem services have changed substantially. The market for carbon sequestration payments has developed enormously as climate change has become increasingly widely perceived to be the world's primary environmental challenge (Stern, 2006). There have been substantial increases in the value of the voluntary market for carbon and the activity in regulatory schemes, notably the EU Emissions Trading Scheme. It is now estimated that the total market for carbon is worth over US$125 billion (Capoor and Ambrosi, 2009) Carbon sequestration, unlike other ecosystem services, is not linked to a specific site or location. This means that northern-based carbon emitters

currently have a greater choice as to where in the world they can offset carbon. In contrast watershed services, and to some extent biodiversity and landscape beauty, are site-specific. This limits the demand for these services as it depends on the presence of a willing buyer at any given site.

In some situations, it is very difficult to differentiate between different ecosystem services while in other situations payment for a single defined service is unlikely to change the incentive structure for land managers. Under these conditions, payments can be constructed for more than one service. This is generally known as 'bundling'. Its proponents, who assume that ecosystem services are complementary, often oversimplify its prospects. For example, a management intervention that leads to greater watershed services is not automatically positive for biodiversity or landscape beauty – there are likely to be trade-offs between these different services (Landell-Mills and Porras, 2002; Wunder *et. al.*, 2008). Because of these trade-offs and the potential conflicts between management interventions, bundling should generally be approached with care. On the other had, a payment mechanism that focuses on only one service can, if care is not taken in design, privilege its provision over other ecosystem services, resulting in negative and unintended impacts.

Payments for ecosystem services are very new additions to the toolbox of environmental managers, and even newer to development planners. Despite recent work, there is little understanding yet about when and under what circumstances they are best applied (Asquith and Wunder, 2008). One of the considerations is the degree to which the landscape has been altered. For example, in a landscape where there is widespread cultivation and associated agricultural infrastructure, the opportunity cost of reverting to its natural or indigenous vegetation is likely to be prohibitive. Under these circumstances payments that aim to restore forest-based ecosystem services are unlikely to be successful. However, if the core problem is with water quality, payments to land managers to utilise in-field soil-water conservation structures may well be appropriate. At the other end of the spectrum, where landscapes are largely undisturbed and there is no immediate threat, beneficiaries of the services may argue that there is no compelling reason for them to initiate payments (Wunder, 2005).

The term 'payments for watershed services' (PWS) now encompasses a range of mechanisms by which downstream water users make payments to upstream land managers to change their land-use systems in order to improve water quality and/or water quantity, or regulate water flows (Landell-Mills and Porras, 2002; van Noordwijk *et al.*, 2004). The use of a PWS approach by the City of New York in the 1980s to solve water quality problems in the Catskill and Delaware catchments provided a high profile and very tangible example of their potential (Pires, 2004) (Box 2). A similar approach by Nestlé Waters to secure the quality of Perrier

Mineral Water served to confirm that PWS could be both successful and highly cost effective for the buyer (Déprés *et al.*, 2005; Perrot-Maître, 2006). Subsequently, similar programmes have been developed in China (the Sloping Lands Conversion Programme – SLCP), Mexico (Payment for Hydrological Environmental Services Programme – PSAH) and South Africa (the Working for Water (WfW) programme).

Photo: IIED

New York drinks clean water thanks to a PWS scheme

At the same time that the City of New York was developing its approach in the Catskill and Delaware catchments, Costa Rica began developing a very successful, PES programme at the national level. Boosted by these success stories, the environmental community began to explore their potential in developing countries (e.g., Simpson and Sedjo, 1996; Ferraro, 2001). As incipient schemes began to emerge in developing countries, questions about their effects for poor people began

Box 2

New York City preserves the 'champagne' of drinking water

The New York City water system provides 9 million people with 4.5 billion litres of freshwater daily. Approximately 90 per cent of the water comes from the Catskills-Delaware (Cat-Del) catchment and is unfiltered. For many years, the water from the Cat-Del watershed was considered to be the 'champagne' of drinking waters. However, in the early 1980s its quality declined significantly, largely the result of intensification of agricultural practices and the increasing urbanisation of the area. At the same time, federal legislation (the *Safe Drinking Water Act*, 1986 and the *Surface Water Drinking Rule* 1989) set stringent standards on the quality of unfiltered water for human consumption. New York City faced building a treatment plant capable of processing the water at a cost of somewhere between US$4 billion and US$6 billion with annual costs of US$250 million. However, through the New York State Department of Agriculture, an alternative deal was struck with farmers that revolved around the 'whole farm plan'. Under the plan, New York City paid for pollution control investments on each farm, with an additional stipend for increased labour costs. The programme was voluntary and administered by the farming community through the 'Watershed Agricultural Council'. Some 85 per cent of the farmers were required to sign up. This was the 'deal-maker' for New York authorities – the threshold level deemed necessary to effectively reduce non-point source pollution. Between 1990 and 1993, 93 per cent of landholders signed up to the programme at a cost to New York City of the equivalent of about 11 per cent of the proposed filtration plant. New Yorkers have retained their champagne drinking water at a fraction of the cost of filtration.

Source: Appleton (2002).

to be asked. Might such schemes marginalise poor people further, or might they do some good? (Landell-Mills and Porras, 2002) The more optimistic scenarios projected a new category of poor land managers conserving landscapes, selling environmental services, and climbing their way out of poverty (Pagiola *et al.*, 2002).

Schemes for payments for watershed services usually fall into one of two categories: National programmes or schemes, generally involving payments by national or provincial governments, transcend the boundaries of river basins or catchments. These programmes tend to commit farmer and land managers to specified land-use changes, but are seldom robustly monitored or enforced (Engel *et al.*, 2008). When these changes have been made or land-use plans agreed, the farmers receive payment. Examples of these national-level schemes are the above-mentioned programme in Costa Rica, plus those in China and South Africa (see Bennett, 2008; Turpie *et al.*, 2008). Strictly speaking, these programmes are not based on market-led relationships between willing buyers and willing sellers for a defined watershed service. As with all government programmes they are politically determined and so are susceptible to changes in priorities, governments and budgets (Pagiola *et al.*, 2002).

The other category of PWS schemes are those that are constructed within a basin, between willing buyers and willing sellers of watershed services for a defined and measurable service – these are also termed 'user-defined schemes' (Engel *et al.*, 2008). Generally, these schemes are premised on a compelling business case in which the buyer of the service gets a cost-efficient solution to a given problem. The above-mentioned New York City and Vittel[3] cases are examples of this, as is the Heredia Public Service Enterprise scheme in Costa Rica. In common with a number of other cases that have subsequently emerged, the problem being addressed by these examples is 'non-point source pollution'.[4]

Subsequent sections of this report describe the efforts by IIED and its partners to assess the state of play with payments for watershed services internationally – how widespread they are and what effects they are having – and to get involved in various contexts to investigate, stimulate and shape emerging schemes, with better local livelihoods and sustainability in mind.

3. The mineral water bottled by Nestlé originates from the 'Grande Source' in the town of Vittel at the foot of the Vosges Mountains in north-eastern France (Perrot-Maître, 2006).
4. The difference between point and non-point pollution is critical. Payments for watershed services should not be used in those cases where water quality is being deliberately polluted by a single and controllable source.

2 The project: action-learning

2.1 Inception phase

Following IIED's global review of emerging practice in environmental service payments, including payments for watershed services (Landell-Mills and Porras, 2002), it joined with other partners to shape and develop efforts to set up payments for watershed services in key countries. The project 'Developing Markets for Watershed Protection Services and Improved Livelihoods' began in October 2001. An inception phase involved diagnostic studies in India (Sengupta *et al.*, 2003), South Africa (King *et al.*, 2003), Indonesia (Munawir *et al.*, 2003) and four Caribbean island states (Geoghegan *et al.*, 2003).[5]

Diagnostic studies were carried out in these countries because they were identified as places where payments for watershed services were beginning to be discussed and appeared to have significant potential. The studies covered many of the issues raised by the global review regarding effectiveness, equity, and impacts on the poor of market-based approaches for watershed services.[6] Some lessons from these diagnostics were later drawn out and these have guided the work that has followed (Geoghegan, 2005) (Box 3).

2.2 Action-learning phase

An implementation phase of the project began in late 2003 – designed and managed by IIED and funded by the UK Department for International Development (DFID). Its purpose was 'to increase understanding of the role of market mechanisms in promoting the provision of watershed services to improve livelihoods' (IIED, 2003). Thus the emphasis was not only on mechanisms for payments from downstream water users to upstream land managers but on developing them in ways that improve livelihoods. Three broad categories of stakeholder were given particular attention: farmers and land managers who are supplying the watershed services; non-farming households resident in the area supplying the services; and poor households if they were required to pay for watershed services. The inception phase pointed strongly to the potential negative impacts of payment schemes on poor people's lives wherever they are located in the watershed – downstream as

5. These reports are available from the project website: http://www.iied.org/natural-resources/key-issues/water/developing-markets-for-watershed-services

6. The India diagnostic included a national overview and more detailed studies of two states, Himachal Pradesh and Madhya Pradesh. The Indonesian study looked in detail at one area, the Segara River Basin. The South African diagnostic provided a national overview. The Caribbean study consisted of diagnostics of four islands: Grenada, Jamaica, Saint Lucia and Trinidad.

well as upstream, non-participants as well as participants in payment schemes – and hence the need for this disaggregated emphasis.

Box 3

Country diagnostics of potential for payments for watershed services: some common findings

Diagnostic studies in India, South Africa, Indonesia and the Caribbean focused on assessing key watershed management issues and needs, potential market actors (beneficiaries and providers of watershed services), the policy and institutional context, and interest in and demand for market-based approaches.

Despite the wide diversity of biophysical, cultural and economic contexts there was consistency in the challenges faced by watershed managers and their responses. None of the diagnostics revealed tangible mechanisms linking stakeholders in the upper catchments with their counterparts downstream. This meant that there was little opportunity for upstream actors to recover the costs of wise land management from the beneficiaries of these practices. However, some of the diagnostics did highlight the presence of various financial and non-financial incentives for watershed management.

The diagnostics collectively spell out major challenges to developing market mechanisms for watershed services, especially in the commonly identified situation where there is:

- **Limited evident demand from potential buyers of watershed services.**
- **Little clarity over the desired land use to support or generate watershed services.**
- **Poor understanding of how payments would be captured and translated into 'good management'.**
- **An absence of cost-effective, reliable and accurate monitoring.**

All the diagnostics concluded, however, that there was widespread interest and some potential for further exploring facilitation of payments for watershed services.

Source: Geoghegan (2005).

The project expected to achieve three outputs (IIED, 2003):

1. Action-learning processes for the development of equitable market mechanisms for watershed services supported in four countries.

2. Diagnostic studies, plans and preparedness established in two further countries wishing to adopt market mechanisms for watershed protection.

3. Knowledge of market mechanisms improved through networking, development of guidance, and dissemination of information with other countries and institutions.

Through this 'action-learning' approach, the project sought to actively engage in the process of developing payments for watershed services and to learn from actions taken. The project thus aimed to focus on the tangible problems and complex

realities of watershed management in 'real time' (the actual time it takes a process to occur) and to draw lessons from this. While this action-learning was focused in four main countries, further diagnostics in two more countries and international capability-building were equally important outputs. 'Action-learning' nevertheless became the methodological approach for the project as a whole. A core team of IIED staff with mixed skills, expertise and regional knowledge was put together to guide the project.

2.2.1 Action-learning in India, Indonesia, South Africa and the Caribbean

The knowledge and experience gained by IIED's partners in the diagnostic work, and the momentum amongst stakeholders to explore PWS-type solutions, provided a platform from which to initiate the action-learning approach in India, Indonesia, South Africa and selected countries in the Caribbean. The structure and methods of the project in each of the countries reflected the unique circumstances within that country and at the chosen sites. Nevertheless, between the countries, there was a common approach that involved:

- **A core research team:** a lead partner institution, well-placed in terms of track-record, contacts, field connections, interest and capability convened a small team in each country. The teams consisted of varying mixes of relevant expertise from different institutions. In order to establish a field presence within the selected action-learning sites, additional partnerships between the core research team and local field-based organisations were developed in each of the countries (see Appendix 1).

- **Site selection:** the diagnostic studies enabled potential sites to be identified and preference criteria were used by each research team to select the case study areas from the larger pool of sites. At some sites in India and Indonesia the research teams were able to work together with ongoing watershed conservation and/or development initiatives. In the remaining sites, such as the Ga-Selati River in South Africa, there were no obvious partners or ongoing processes and the challenge of facilitating payments for watershed protection services had to be started from scratch.

- **Baseline studies:** at most of the selected sites baseline studies on livelihoods, land use, and hydrology were undertaken. The purpose of these studies was to identify the livelihoods challenges and opportunities, document current land use, and identify the core problems and potential interventions. These studies were context-specific – seeking different degrees of participation with stakeholders, depending on the scale of the issues and the skills available.

- **Learning groups:** an essential component of action-learning as a methodology is that the participants and stakeholders take time to reflect on the process, to question, and to seek to understand lessons learned (Dick, 1997; Sayer and Campbell, 2003). In each country, IIED and partners constituted learning groups that typically comprised a range of stakeholders from government, civil society and, where possible, the private sector. For those stakeholder groups difficult to engage with through the learning groups, partners used combinations of targeted seminars, exchange visits and site-specific interactions.

- **Applied research and analysis:** to support both the site-level and learning group work, the research teams identified key issues and problems that needed to be addressed. Typically this led to the development of short, commissioned reports – such as reviews of the legal framework for payments for watershed services in India and South Africa.[7]

Ten sites were selected as action-learning sites (see Table 1), including the Rio Los Negros site from Bolivia. Although Bolivia was formally a diagnostic country (see Section 2.2.2) the implementation of a PWS scheme by Fundación Natura at Los Negros provided the project with an additional action-learning site. The sites exhibited considerable diversity in terms of their spatial scale, context, and the perceived core problems (see Appendix 2). The diversity of the sites provided the project with the opportunity to test different approaches to a wide variety of problems. Conversely, it also presented IIED and partners with a major challenge to effectively synthesise the experience and extract the lessons learned from the core-teams' experience within each site and to disseminate these to a wider audience.

Photo: IIED

Should I pay people upstream for this? Water user in Indonesia

An effective and enduring PWS arrangement is based on identifying a clear cause and effect relationship between upstream land use and downstream water needs (Engel *et al.*, 2008; IUCN, 2006; Wunder, 2005). In essence, it is necessary to identify the core problem of the water users and the land-use change that will lead to its resolution. Engel *et al.* (2008) point out that it is essential that not only are the land-use/water relationships understood, but that the problem affects people and water who live further downstream, i.e. the impacts on the water users is an externality caused by land use. Only when this condition is fulfilled is a PWS solution appropriate.

7. Selected background papers are available as working papers from http://www.iied.org/natural-resources/key-issues/water/developing-markets-for-watershed-services

Table 1

Summary of project sites, core problems, watershed services and buyers

Country	Watershed/ catchment	Area	Core problem	Services	Land-use change	Buyer(s)
India	Bhoj Wetlands, Madhya Pradesh state	361 km^2	High levels of agro-chemicals in Bhoj Wetlands and lake	Water quality	Switch to organic farming practices	Possible: Bhopal Municipal Council, corporate bodies, public
	Bhodi-Suan, Himachal Pradesh state	7 km^2	Soil erosion and siltation of proposed dam and low dry season flows	Water quality and quantity	Soil conservation and zoning	Possible: Inter-village mechanism
	Kuhan, Himachal Pradesh	4-5 km^2	Soil erosion and siltation of dam	Water quality	Soil conservation and zoning	Inter-village mechanism
Indonesia	Brantas, East Java province	12,000 km^2	Deforestation causing erosion and siltation of Brantas River	Water quality	Tree planting at pilot sites	PJT1 -government river basin authority
	Cidanau, Banten province	226 km^2	Erosion causing high silt and inorganic chemical loads	Water quality	Tree planting at pilot sites	KTI government owned industrial conglomerate
Jamaica	Buff Bay/Pencar	202 km^2	Contamination due to pesticides fertilisers and sewage	Water quality	Reduced contamination from agriculture and settlement	Potentially water consumers in coastal areas
Saint Lucia	Talvan	3,2 km^2	High levels of pollution	Water quality	Reduced contamination from human effluent	Potentially water and sewerage company and consumers
South Africa	Sabie-Sand, Mpumalanga Province	7,361 km^2	Reduced streamflow caused by invasive alien species in montane grasslands.	Water quantity and quality	Site-specific	Not developed
	Ga-Selati, Limpopo Province	2,338 km^2	Decreasing streamflow in upper Ga-Selati River due to alien invasive species and inefficient irrigation methods.	Water quantity	Removal of alien invasive species. Improved irrigation technology	Potentially commercial farmers and mining companies at Phalaborwa
Bolivia	Rio Los Negros watershed, Santa Cruz department	250 km^2	Changing land use reducing water quantity	Water quantity	Maintain forest cover	Commercial horticultural producers in Los Negros town

At six of the ten sites (Table 2), the core problems being addressed by the project are primarily concerned with water quality. Of these, four are focused on silt loads and erosion while the others are concerned with agricultural chemicals, effluent and bacteria. The Ga-Selati River in South Africa was the only site where water quantity was a specific focus. In the Caribbean sites it was difficult to disaggregate the watershed services – water quality, flood control, biodiversity and landscape beauty all contribute to the 'watershed service'.

Photo: Kirsten Henninger

Working out what to measure: participants in the Kuhan PWS scheme in India

The emphasis on water quality (six sites) rather than quantity (one site) is important, given that much of the international policy debate around payments for watershed services and land use has tended to emphasise water quantity rather than water quality (see Calder, 1999 and 2005; Bruijnzeel, 2004; The Economist, 2005). However, two of the most frequently cited PWS success stories, New York and the Vittel Catchment, both dealt with actual or potential water quality issues. This suggests that generalisations in approach to developing PWS initiatives and blueprint approaches to changes in land management (e.g. tree planting) are of limited value.

2.2.2 Diagnostic studies in Bolivia and China

Action-learning activities were complemented with further diagnostic studies carried out in Bolivia and China. These two countries were selected from a potential shortlist (Peru, Bolivia, China, Mexico, Vietnam and the Philippines) against a range of criteria (possible collaborators, stakeholder demand, presence of major learning opportunity, value-added, timeliness and potential influence, data availability, and partner's capacity and enthusiasm). These diagnostics added to those in the inception phase and built on the earlier work, drawing lessons from actual cases (and on the work of others offering guidance based on economic theory) by engaging in real-life contexts to examine how payment mechanisms might usefully be inserted into complex and multi-level management, institutional and policy structures.

As in the action-learning countries, IIED and a locally based organisation formed the core research team for the diagnostic studies. The focus of the work in the two countries was quite different but in each case the work was more detailed than in the previous phase of the project.

In China, the government is applying diverse potential solutions to the country's significant environmental problems, including payments for adopting specified land-use practices (Jianguo Lui and Diamond, 2005). The underlying hypothesis for the diagnostic study was that the fiscal and political burden of current public payments

Figure 2

Countries with action learning sites and diagnostic studies in this project

Photos (clockwise from top left): Tighe Geoghegan; Satyaprasanna/WI; Rahadian, Rekonvasi Bhumi; Nicola King and Asquith and Vargas.

* The project's work in China focused on policy analysis and there were no specific action learning field sites.

for watershed services will not be sustainable (Li *et al.*, 2007). Using a combination of national reviews and local case studies the team looked at what other options or complements to such publicly funded payment programmes might exist.

In Bolivia, buying and selling environmental goods and services is a particularly sensitive political issue (Robertson and Wunder, 2005). Here, as in many developing countries and even before the Morales[8] government sharpened the focus on these tensions, 'markets' can have negative connotations for many. 'The market' tends to be closely associated with the negative impacts of globalisation and economic structural adjustment programmes advocated by western-based organisations, particularly the World Bank and the International Monetary Fund (Wunder and Vargas, 2005). Nevertheless, Bolivia is facing severe land-use and water problems, and some stakeholders consider it important that payments for watershed services be explored

8. In 2005, Juan Evo Morales was elected as Bolivia's first fully indigenous head of state since the Spanish Conquest. As the leader of the Movement towards Socialism (MAS), Morales was involved in the Cochabamba protests about water rights.

(Asquith and Vargas, 2007). Like the Chinese diagnostic study, the Bolivian study combines national-level reviews and analyses with local-level case studies in an attempt to influence the development of effective and pro-poor government policy affecting watersheds. Fundación Natura in Bolivia, the leader of the study, is also responsible for facilitating a nascent PWS scheme in the Rio Los Negros watershed. The inclusion of the Bolivia diagnostic thus gave the project and its partners the opportunity to learn from this site.

2.2.3 International networking, case review, guidance and dissemination

Since the publication of the global review (Landell-Mills and Porras, 2002), IIED has been part of a community interested in the potential for, and likely problems associated with, marketing environmental services. Output Three of the project (see page 22) focused on networking, continuing international case studies review, and the dissemination of information and lessons learned.

Starting in 2006, IIED repeated the global review of payments for watershed services initiatives, this time coming up with a sample of 123 initiatives in developing countries (which included some of the 61 PWS case studies in the wider review of 287 case studies of PES by Landell-Mills and Porras in 2002). Case studies were selected for the sample if there was evidence of: voluntary payments; at least one buyer and one seller of watershed services; and payments being made on the condition of land-use change. A desirable, but not binding, condition was that private sector stakeholders were paying for 'public goods' or that the payments were being made from new sources of 'public funds'. Of the 123 cases examined, 75 were excluded from the statistics because they were either borderline in terms of PWS definition or there was insufficient information in the public domain to include them in the final analysis (Porras *et al.*, 2008).

A Project Advisory Group of key individuals from this international community plus some of the project team met three times during the project and communicated actively throughout the process of action-learning amongst the project partners. Two external advisors, Dr. Bhaskar Vira[9] and Professor Peter Frost[10], played particularly important roles in questioning and interrogating the results of the project throughout. This was necessary to reduce the confirmation bias that resulted from the country teams being both advocates for PWS approaches and evaluators of the results (Sayer, 2007).

The project sponsored and co-sponsored several important events, exchange visits and communication tools. These included:

9. Department of Geography, University of Cambridge.
10. Formerly of the University of Zimbabwe and now part time for CIFOR.

- A joint workshop on PES co-sponsored by the Center for International Forestry Research (CIFOR) and the Center for Development Research (ZEF) in Germany.[11]
- A learning event in Bellagio, Italy, of key international players to capture and share current thinking on PWS.[12]
- Production of a documentary film on payments for watershed services that was broadcast on BBC World.[13]
- The production and dissemination of a regular electronic bulletin, *Flows*.[14]

Photo: Ina Porras

A China-Caribbean partnership – sharing experience is critical for developing PWS

- A facilitated visit by project partners to PES programmes in Costa Rica that was particularly effective at generating ideas that have subsequently stimulated further decisions and policy in the partner countries (Porras and Miranda, 2006).

2.3 Reflections on the project's approach

The rest of this report is about the findings and lessons learned from the project in developing payments for watershed services. In this sub-section we take the opportunity to reflect on the validity of the project's approach, the robustness of the underlying concept, the performance of IIED in executing the project, and the extent to which the project has contributed to the ongoing global debate about payments for watershed services. While action-learning methodologies have many advantages there are no control sites. Thus the outcome of this project is to some extent dependent on the skills, experience and personalities of those people

11. The presentations from this workshop form the bulk of the Special Issue of *Ecological Economics* (2008) titled 'Payments for Environmental Services in Developing and Developed Countries' (Volume 65, Issue 4, May 2008), editors: Sven Wunder, Stefanie Engel and Stefano Pagiola.
12. This has been presented as *Payments for Watershed Service: The Bellagio Conversations*, editors: Nigel Asquith and Sven Wunder. See: http://www.naturabolivia.org/Informacion/The%20Bellagio%20Conversations%20FINAL%202.pdf
13. 'Shed Loads – paying to protect watersheds' was broadcast five times on BBC World in September 2005. A Spanish version was produced for dissemination in Central and South America and a Bahasa Indonesian version for Indonesia. Material from the Bhoj Wetlands in Madhya Pradesh was used by the Indian team to produce another film, 'Lake Matters'.
14. *Flows* is a regular bulletin aimed at summarising and disseminating research work and stimulating ideas and communication between people developing and implementing PWS mechanisms. It has been jointly supported by IIED and the World Bank.

involved. It is a moot point whether a different set of actors would have produced the same set of results.

The project was independently evaluated in late 2006 and early 2007. The evaluation was based on a review of documentation, field visits, and extensive interview and questionnaire responses from those connected to the project, with knowledge of it, or working in the PES field (Sayer, 2007).[15]

Sayer noted that: 'This project was initiated at a time when there was a wave of interest in PES/PWS amongst international environmental organisations, governments and intergovernmental processes. PES was, and in some quarters still is, being promoted as a major response to dealing with the linked problems of alleviating rural poverty and conserving global environmental values. There was a need to acquire evidence on the real potential of the approach to be effective on the ground. The project responded to this need and has been the major international initiative to move beyond advocacy and speculation. [It] has made a major contribution to instilling a sense of reality into the debate.'

The evaluation report concluded that 'action-learning, of the type supported by this project, would be very valuable in helping to define where and when PES/PWS are appropriate and helping to establish the underlying conditions for these mechanisms to realise their potential impact. A "community of practice" has been built and a number of the local partners have embarked upon valuable watershed conservation programmes. The potential for future impact is great' (Sayer, 2007).

IIED recognises the importance of continuity in the processes that it has been involved in starting. The PWS team remains involved in networks of PWS practitioners and – to the extent possible – engaged in the sites and with many of the project's partners. Follow-up investigations as to the durability of the changes observed are being planned and the results will be published as working papers and made available on the website.

The impact of the project at a policy level is more difficult to assess. We know that:

- The Chinese government has adopted PES principles as part of its latest five-year economic plan.
- In South Africa, a water pricing strategy has created a trading arena for watershed ecosystem services.
- In Bolivia the Sustainable Development Secretary in the Santa Cruz department

15. This independent project evaluation is available from http://www.iied.org/natural-resources/key-issues/water/developing-markets-for-watershed-services

has announced a new environmental policy for the department's 32 million hectares, with a strong emphasis on PES.

- In India, the new forest policy in the state of Himachal Pradesh emphasises market-based mechanisms to environmental services, and the state is starting large-scale pilots.

The project and its activities appear to have contributed to these decisions, but they are unlikely to be solely as a result of these.

Table 2

Summary findings of an independent evaluation of the project: 'Developing markets for watershed protection services and improved livelihoods'

For each issue the evaluator has given a score: 10 represents the highest score and zero the lowest possible score.

Issue	Score	Comment
The concept, design and execution of the project		
Project concept and quality at entry	9	The basic ideas underlying the project and its approach were excellent
The design of the project	7	Action-learning through mentoring of local partners was the best approach – the project was over-ambitious in terms of what could be achieved in three years
The concept and practice of action research	8	Testing ideas in real-life field situations was essential. More structured scientific methods might have been used
IIED's approach and comparative advantage	9	IIED performed well in guiding the field work without imposing external assumptions or prejudices
Choice of partner countries and IIED's history of involvement	8	The countries chosen covered an interesting range of situations and included some where IIED had considerable experience and two that were new
Action research design	7	There was not enough investment in developing typologies, clarifying concepts and terms and giving structure to data collection
Technical backstopping by IIED	7	Administrative and process backstopping were of a high quality – there was not enough specialist technical support provided to some countries
Scientific methods – tools	5	Some potential for learning was lost through the absence of a more rigorous conceptual and methodological framework
PWS models considered	7	The range of approaches to PWS considered appears with hindsight to have been too limited – but the project was too short to make changes
Site selection within countries	7	Sites selected were not always optimal, more investment in establishing criteria at project inception might have yielded better choices
Links with the diagnostic phase	8	The project activities flowed nicely from the diagnostic phase that had proceeded.

The need for rigorous outcomes measures	5	A more rigorous system for assessing outcomes in terms of poverty alleviation and watershed performance at learning sites would have been desirable but probably not feasible with the budget and the duration of the project
Confirmation bias	8	The project was commendable in being rigorous and honest in the interpretation of its results
The risks of downplaying the need for zoning and regulation	6	The PWS debate risks diverting attention from more classic regulatory approaches to watershed protection; Bolivia, Indonesia and the Caribbean may have given insufficient attention to these conventional approaches
Project leadership	9	The quality of leadership provided by IIED was high
Continuity of staffing	8	Again the ability of IIED staff to manage changes in field partners' staffing was commendable
Communications and dissemination of results		
Communications amongst partners and cross site visits	8	Partners communicated well – an opportunity was lost in not having more meetings on-site in partner countries
Action-learning groups and national learning	8	A strong part of the project – this worked well
Reporting of results	7	Too many general and descriptive reports and not – yet – enough synthetic and targeted ones
FLOWS	8	A valuable web-based newsletter
Web-sites	7	Some excellent, others more difficult to access for comprehensive information
Peer-reviewed journal articles	5	Still time to rectify this but it would be good to put the key findings in the refereed literature
IIED's profile in the international policy dialogue	8	IIED is amongst the international leaders on PES/PWS innovations – it may not have the international recognition that its PWS work would merit
'Shed Loads'	8	A valuable film that got television coverage for the project but potential not fully exploited, although this and 'Lake Matters' had good impacts in India
Comparison with other PWS initiatives	8	The most credible international initiative in this field
Impact on global policy discourse	8	Significant impact – but in a low profile way. Participation of national partners in international events was a major potential source of impact
Impact in participating countries	9	In every country the IIED activities have been highly influential in the national policy discourse
Exit strategies and continued support to national partners	7	The project did not have an explicit exit strategy, there was an assumption that support to national partners would continue. National partners have the potential to deliver significant impact and the learning network created by this project needs to be maintained

Source: Sayer (2007).

3 Findings and discussion

The project's findings are presented in two sections. Section 3.1 covers findings from the action-learning sites with supporting evidence from the diagnostic countries. Section 3.2 highlights the main findings from the analysis of 50 cases across developing countries.

3.1 Country- and site-level findings

The site-level descriptions (Table 1) highlight the diversity of contexts and the activities that were carried out by the action-learning teams. The action-learning approach allowed each team and their local partners to tailor their activities to the scale and conditions of the site. This provided the opportunity to adapt plans in response to local opportunities and challenges, within the broad framework provided by the overall project. It is important to note that our project did not select a random set of watersheds, but worked in selected sites that were identified as having potential to develop a PWS mechanism. As the individual country studies in the Caribbean and Bolivia have shown there are many watersheds where there is no immediate prospect of a buyer and therefore little chance of addressing problems through a PWS mechanism (Asquith *et al.*, 2007, McIntosh and Leotaud, 2007).

3.1.1 Payments and payment mechanisms developed

In each of the action-learning sites the focus of the work has been on facilitating direct payments between suppliers and buyers of watershed services. In three of the ten sites the project facilitated new financial relationships between suppliers of watershed services and downstream buyers (Boxes 4 to 7). These arrangements were developed in the inter-village site of Kuhan in Himachal Pradesh, India, and the pilot sites in the Brantas and Cidanau watersheds in Indonesia. At a fourth site, Rio Los Negros in Bolivia, the project has contributed to a strengthening of a nascent payment scheme that was developed by Fundación Natura before the current phase of the project began.

The payments at these four sites must be seen and evaluated in terms of the scale and the context of the catchments. By any measure, these payment mechanisms are pilot interventions, taking place within much larger, dynamic and complex catchments. On their own, and in their current form, they are unlikely to have any significant impact on the core biophysical problems that have been identified by the stakeholders and the research teams. However, in each case they do represent a new relationship between downstream users of water and upstream land managers. As

Box 4

Rio Los Negros, Bolivia – beehives and barbed wire

Within the Los Negros catchment in Bolivia, the NGO Fundación Natura is using external funding sources to facilitate payments between upstream and downstream farmers in the Santa Rosa community, covering some 250 km² within the catchment. Farmers who agree not to extend their area of cultivation into the cloud forest are provided with one beehive for every ten hectares of forest conserved. In the second year of operation, the farmers requested and received barbed wire instead of beehives. The external funds used to buy the beehives and the barbed wire have been supplemented by two payments from the local municipality.

- **Action:** agreement not to extend cultivation into 2,000 ha of montane cloud forest.
- **Payment:** external funds from USFWS (donor), supplemented by a payment of US3,500 from the local municipality, have been used to prime the agreement.
- **Verification:** through Fundación Natura.
- **Other:** some 34 upland subsistence agro-pastoralist farmers are involved to date, with numbers doubling in each of the last two years. Transaction costs estimated to be US$23,000 for three years.

One of the greatest challenges, but also one of the most important benefits of the programme, has been to build trust between all the stakeholders in the Los Negros catchment.

Source: Asquith and Vargas (2007).

such, they represent a new way of doing business in each catchment, albeit at a very small scale.

The project design implicitly assumed that the core teams would be able to engage, strengthen, and support ongoing PWS mechanisms, which would have allowed robust lessons on their impacts and effectiveness (Sayer, 2007). In three out of the four sites, where PWS relationships were developed and strengthened, the project was able to engage with ongoing processes whose origins pre-dated the project. It is important to note that these processes were not previously aimed at developing a PWS instrument. For example, the process at Kuhan benefited considerably from the work done by the Changar Project,[16] which meant that there were functional village development committees and ongoing conversations about land use, conservation, and water management (Agarwal *et al.*, 2008). In contrast, the core teams at other project sites (for example the Ga-Selati and Sabi-Sand rivers in South Africa as well as the Bhoj Wetlands in India) had to start by developing relationships and building organisations, as well as having to collect and analyse the data necessary to begin facilitating a PWS scheme.

16. The Changar Project was jointly funded by the Indian and German governments. The project focused on watershed treatment and livelihood enhancement in 37 micro-watersheds that were further sub-divided into mini-micro watersheds in the Changar region of Himachal Pradesh (Agarwal *et al.*, 2008).

In part this highlights the importance of functional community-based organisations (CBOs) as a precursor to the success of innovative instruments like PWS. Without effective CBOs – such as farmers' groups or village development committees – it is very difficult to introduce new concepts, especially within the time constraints faced by a project of this sort. It is even harder in developing countries where the landholdings are small and there are more people per hectare to interact with and transaction costs of individual interaction may be prohibitive. Trust between the intermediaries and the existing CBOs is also important. Where trust exists it can reduce the time needed to introduce, modify and implement innovative relationships between stakeholders (see Wunder, 2005).

In three of the four sites where payments were made, watershed service buyers located within the watershed. In the fourth, Los Negros, the donor funds used to 'prime' the relationship are complemented by money from the local municipality[17] (Asquith and Vargas, 2007). Monitoring and contingency are being enforced in three sites, the exception being Brantas where PJT1 (the government management body for the Brantas catchment) has made a one-off payment. In three of the cases where there has been a financial transaction, the NGO facilitators have also acted as the intermediaries for the payments. In Kuhan, where the payment has been made 'in kind', there has been no need for an intermediary to act between the two villages.

Box 5

Kuhan micro-catchment, India – saplings for silt control

Within the Kuhan catchment in Himachal Pradesh, the core problem is the high silt load due to erosion in the upper part of the catchment. The source of the silt was identified as a degraded area of land (approximately 12 hectares) used for grazing. An agreement was facilitated between the two village development committees to rehabilitate this land. The final agreement included:

- **Action:** closure and replanting of a degraded grazing area of 12.1 ha by 21 families in the upstream village of Oach Kalan, for a period of up to eight years.
- **Payment:** 330 seedlings financed from irrigation charges provided and transported by buyers (downstream village of Kuhan Khas), as well as agreement over the future use and rights over trees and grass.
- **Verification:** The agreement is being monitored jointly by the development committee of each village.
- **Other:** compensation mechanisms if the terms of the agreement are broken.

A further set of activities was developed during the ongoing negotiations, which focused on the construction of brushwood check dams on the sub-streams that flow into the major stream between the two villages. A further action, yet to be implemented, is planting bamboo in streams to trap and reduce silt levels.

Source: Agarwal *et al.* (2008).

17. The external donor was the United States Department of Fish and Wildlife (USDFW). No project funds were used to 'prime' PWS relationships in this project.

The logic of PWS suggests that payments need to be regular and sustained in order to ensure that the sellers do not revert to previous, less desirable land-use practices (Wunder, 2005). This is also referred to as 'permanence' and has been identified in other reviews of PWS (Wunder *et al.*, 2008). In our project case, some of the mechanisms developed to date in the sites will not last much beyond the timeframe of the project. For example, while the grazing exclusion in Kuhan catchment has been agreed for eight years, the 300 saplings that formed the payment was a 'one off' payment. Only time will tell whether the agreement will be honoured for the full eight years by the upstream farmers. Since its implementation, the upstream farmers have been able to harvest more grass while downstream the membership of the irrigation group has increased from 8 to 50 families.

In the Indonesian sites the current contracts are for between three and five years but with an option to renew. Regular payments have been made in both the Cidanau and Brantas sites. Payments are conditional upon the previously agreed targets of the number of trees planted being met. Additionally, at the Brantas site the conditionality has been extended to the survival of seedlings and the maintenance of the terraces.

Box 6

Brantas River catchment, Indonesia – cash and access to springs

The Brantas River is 320 km long, draining a catchment of 12,000 km^2. The core problem is the sedimentation of dams. Volcanic eruptions account for 44 per cent of the sediment while a further 40 per cent stems from landslides due to the unstable geology of the catchment.[18] An estimated 16 per cent of sediment is from erosion primarily due to dryland cultivation and illegal logging on steep slopes. A pilot payment mechanism was developed between PJT1 and small-scale farmers in a critical upland area – Tlekung (66 farmers) and Bendosari (77 farmers).

- **Action:** tree planting on 40 ha of critical land in two villages as well as construction of terracing.
- **Payment:** US$5,800 from PJT1 over a three-year period with an option to renew the contract. Support from District Forest Office for nursery and a licence to access and manage six springs from the state-owned forestry company.
- **Verification:** through YPP, a locally based NGO, but payments are made on condition that targets for planting and survival are met.
- **Other:** a third farmers' group has voluntarily joined the scheme - Sukomulyo (27 farmers).

Although the direct incentives to participate in the payment scheme were relatively small, the facilitators note that the importance of unrestricted, albeit small, funding is sufficient to attract others to the programme.

Source: Munawir and Vermeulen (2007).

18. In 2007 a massive mud flow was triggered by oil exploration near the city of Surabay, in the Brantas River catchment. In an effort to divert the mud, some of it has been diverted into the lower reaches of the Brantas River (see: http://news.bbc.co.uk/2/hi/science/nature/7699672.stm).

The arrangements facilitated by Fundación Natura in Bolivia centre on regular payments – farmers receive one beehive for every ten hectares of forest conserved per annum. The NGO used donor money to make compensation payments while the initiative was developed, but only until a fund was set up by the downstream water cooperative and the municipal government (Le Tellier *et al.*, 2009). Local resources, including an earmarked 9 per cent increase in water rates, are now generating most of the direct payments to upstream landowners

In all project sites it can be said that the buyers and sellers are engaged in experiments – and that their commitment to develop and sustain the initiatives depends on the outcome of their experience. In all cases these new relationships have been characterised by a level of enthusiasm and optimism that exceeds the financial scale of the transactions (Agarwal *et al.*, 2008). In the short term it is likely that the participants will continue to adapt and modify their relationships. The prognosis for the relationships in the medium to long term is unclear and will depend largely on the perceived outcomes by the stakeholders. The spontaneous request by the 27 farmers of Sukomulyo village in the Brantas to be included in the nascent scheme is the only tangible evidence of replication within the sites (Munawir and Vermeulen, 2007).

Box 7

Cidanau catchment, Indonesia – cash for erosion-blocking trees

Erosion is causing massive sedimentation problems within reservoirs on the river in the Cidanau watershed in Indonesia. Soil loss through erosion within the catchment is estimated to be in the order of 146 tonnes per hectare per annum, with an estimated 479,500 tonnes of sediment being deposited in the river annually. The turbidity of the water in the river has increased 14-fold between 1999 and 2005. High nutrient loads combine with the sediment to block waterways and pumping stations. A pilot payment mechanism was developed through the Cidanau Catchment Communication Forum (Forum Komunikasi DAS Cidanau – FKDC) between PT Krakatau Tirta Industri (PT KTI), an industrial conglomerate, and two farmers groups from the villages of Citamen (43 farmers) and Cibojong (29 farmers). The final agreement reached was:

- **Action:** replanting 50 ha of critical land.[19]
- **Payment:** each farmers group receives US$80 for every 500 trees planted. Total value of the agreement is about US$32,500 over five years.
- **Verification:** payment is conditional upon planting and the maintenance of previous seedlings. An *ad hoc* team formed by the FKDC is responsible for verification of the agreement. However, the intention is to form a permanent committee.

FKDC was a trusted and known facilitator to both KTI and the farmers groups. If it had not been present and well known to all the key stakeholders it is very unlikely that this payment mechanism could have been developed in the time available.

Source: Munawir and Vermeulen (2007).

19. In Indonesia critical land is defined by its slope and susceptibility to erosion as predicted by the Universal Soil Loss Equation (USLE).

Where activities have been started as pilots, it is important to question whether they can either be replicated or scaled up. Replication implies that the pilot is reproduced many times over while scaling up implies that the initial design is correct and that it is then just applied over a much larger area, generally at a lower cost. Replication at the geographical scale of the pilot sites in Bolivia[20], India and Indonesia is probably possible, albeit limited by financial resources, human skills and the availability of appropriate sites. The options for scaling up these pilots sites into much larger projects is much less clear.

Within the timeframe of this final phase of the project, payment mechanisms were not developed at the other sites (in South Africa, the Caribbean, and Bhoj Wetlands and the Bhodi Suan catchment in India). However, the lessons learned from these experiences are important in contributing towards the project's purpose, which is to increase understanding about the role of market mechanisms in promoting the provision of watershed services to improve livelihoods.

In South Africa, a number of options for PWS mechanisms were identified on the upper Ga-Selati River, Limpopo Province (King *et al.*, 2008). These included: a proposed partnership between commercial farmers and poor adjacent communities (under the 'Working for Water' programme) to clear alien invasive species in the Legalametse Nature Reserve. However, rapid changes in land ownership within the upper catchment and the pre-occupation of the remaining commercial farmers with processes of land restitution meant that very little progress was eventually made (King *et al.*, 2008) This is an interesting variation on the assumption that secure land tenure is a precondition of the sellers of watershed services (Pagiola *et al.*, 2005; Landell-Mills and Porras, 2002).

Within the second South African site in the Sabie-Sand catchment, project activities did not progress beyond the baseline hydrological assessment. This was due to: the absence of a clear land-use–water problem; the absence of any demand by the downstream water users; the limited skills of the local partner; and competition between organisations within the catchment (King *et al.*, 2008). As in the Ga-Selati River catchment, land restitution and land claims were and remain the overwhelming priority of the downstream farmers who could have been potential buyers of watershed services. The experience from the two South African sites confirms the importance of the demand for watershed services – where there is no current demand, no PWS relationship is possible.

20. Since the project, Fundación Natura has started PWS schemes at two more sites and is scaling up at a third (M. T. Vargas, pers. comm.).

Similarly, in the original Caribbean sites of Talvan (Saint Lucia) and Buff Bay (Jamaica) there were no clear willing buyers (McIntosh and Leotaud, 2007). During the project, it became apparent that there would have been greater potential from tourism enterprises located on or near the coast to become buyers of watershed services. However, even the sources of erosion causing the siltation of reefs are unclear and contested. Publicly, much of the blame for the erosion has been attributed to land-use change, agriculture, and other activities in the watersheds. But there is also a sense that the construction of the hotels themselves, and the consequent disruption of fragile coastal ecosystems, could be as much to blame. Politically and financially, the tourism enterprises benefit from political patronage and/or subsidies, while tax payers firmly believe that government bears the responsibility for watershed management (Leotaud, 2006).

Recognising the importance of potential buyers of watershed services, the core team in the Bhoj Wetlands, India, developed a specific communications strategy to raise both public and corporate awareness of the value of the wetlands, which provide Bhopal City with much of its water. This included: seminars for private sector representatives and the media; the production and distribution of public relations material; street theatre performances; a painting competition; and a film, 'Lake Matters' (Saigal *et a*l., 2005). The strategy was very successful in raising the profile, value, and challenges facing the Bhoj Wetlands. It has certainly initiated debate about the future of the wetlands, its role in providing water to Bhopal City, and the cost-effectiveness of a proposed pipeline from the Narmada River (Agarwal *et al.*, 2008).

The Bhoj Wetlands face a number of significant and important challenges. These include: over-abstraction, contamination by solid and human waste, and pollution caused by inorganic fertilisers and other farming chemicals from the upper catchment. However, trials of the proposed solution, namely organic farming practices, showed very mixed results as many farmers reverted to inorganic compounds during the cropping cycle (Agarwal *et al.*, 2008). As in the other sites where no payment mechanism was developed, the process adopted by the project has highlighted the technical, political and governance challenges to developing a PWS mechanism between the City of Bhopal and the residents of the upper catchment.

In summary: the project selected ten sites at which the core teams believed that there were good chances of developing nascent payment mechanisms for watershed services. Over three years the in-country teams worked with partners and stakeholders to develop payment mechanisms. In three of the sites, new payment mechanisms between upstream land users and downstream water users were developed. In Bolivia, the payments scheme on the Los Negros was strengthened through the work of the project. The site also provided a model and inspiration to the teams working at the other sites. The results from these four sites are important and

have provided important insights into PWS relationships. All four are effectively pilot sites in much larger catchments. The key lesson from the remaining six sites is that without strong demand for watershed services, little progress is possible. In at least one of the sites (Ga Selati, South Africa) there was a clear opportunity but, for the duration of the project at least, the potential buyers had other priorities.

3.1.2 Direct and indirect impacts on livelihoods

Payments for watershed services made in the action-learning sites have, at best, supplemented livelihoods and created a diverse set of indirect benefits (Table 3). Experience in this project strongly suggests that we must dispense with any simplistic notion that large numbers of homogeneous poor upland land users can have their livelihoods quickly and easily improved by payments for watershed services. In the three sites where a PWS mechanism was developed, the gross value of the payments made was relatively small compared with the number of beneficiaries. At the Cidanau sites, for example, project partners concluded that, 'farmers find the payment level insufficient to make a meaningful contribution to their daily needs' (Munawir and Vermeulen, 2007). Similarly, the analysis of the impact of the payments made in a fourth site, Los Negros, notes that 'the direct impacts of the beehive transfers in Los Negros have been small and variable' (Asquith and Vargas, 2007). In the inter-village example of Kuhan, the PWS agreement was made up of labour and money converted to saplings at the request of the upstream village (Agarwal *et al.*, 2008).

There are several reasons for caution in considering PWS as a tool for poverty alleviation on any substantial scale. For a start, the administrative and technical capacity required to run a payments scheme is likely to take a long time and substantial resources to develop. In many countries, such as those in the project, PWS is a new approach to environmental management – the skills and experience to develop PWS approaches do not exist. Secondly, the simple dichotomy of the poor being upstream and the wealthy being downstream rarely holds true: it is sometimes reversed (for example in South Africa) and is usually much more complicated (FRP, 2005). Thirdly, there is little homogeneity amongst buyers and the sellers of watershed services. For example, while most recipients of payments in the project can be considered to be poor, they are nonetheless landholders or managers. The poorest sectors of society have little or no access to land – such landless people make up some 10-40 per cent of the adult population in the Brantas and Cidanau sites, for example (Munawir and Vermeulen, 2007). In short, the simple theoretical constructs that have characterised the PWS debate help us little when it comes to real watersheds – which are generally characterised by high degrees of economic, social and tenurial complexity.

Table 3

Direct payments and indirect benefits at four project sites

Country and watershed	How many sellers and buyers of service?	Payments	Direct impacts	Indirect benefits
Bolivia: Rio Los Negros watershed, Santa Rosa community	• Sellers: 34 households in forest area (2006) • Buyer: Los Negros municipal government on behalf of individual downstream irrigators • Additional support from donors who covered start-up and running transaction costs	• One beehive for each 10 hectares of cloud forest conserved per year • In year two farmers requested – and received – barbed wire rather than beehives *In return for:* • Protection of upstream forest (largely cloud forest)	Small and variable: • US$3 per hectare of forest per household per annum. • Apicultural training (equivalent to a gain in human capital of $35 per participant) • NPV (net present value) of beehives of minus US$15 to US$12 per annum • Some landless people have been able to buy beehives from participants; others are employed in honey processing	Larger and more positive: • Establishment of four environment committees in the watershed • Formation of an Association of Beekeepers • Reduction in upstream–downstream tension and increased cooperation and trust • Recognition that watershed management is everyone's problem, to be solved together
India: Kuhan catchment, Himachal Pradesh	• Sellers: 21 households in upstream village • Buyers: 52 irrigation users in downstream village • No external financial support	• 330 saplings • Grass • Contribution to transport of saplings and labour *In return for:* • Closure of 8-10 ha of private land to grazing	Limited and longer-term: Upstream: • Significant increase in (fodder) grass harvest • Timber from saplings once 20 years old Downstream: • Big increase in irrigated area and in yields • Expansion in vegetable growing Anticipated: • Reduction in silt and therefore greater capacity in dam	• Erosion reduced using check dams and vegetative barriers • Improved inter-village cooperation in the face of threat to water supply from faulty road construction • Improved governance in downstream Village Development Committee Some negative impacts: • Some have had to seek alternative grazing areas • Disputes over access to water

Indonesia: Brantas watershed	• Sellers: three farmers' groups (total 239 members by 2006) • Buyers: Industries, municipality, commercial sector and hydropower sector through PJT1 and YPP as intermediaries	Two contracts: • US$3,800 from PJT1 over two-year period, with option for renewal • US$220 from district forest office • As well as state-owned forestry company contributing 0.25ha for seedling production and management of six springs	Upstream: • Direct impact low but in the context of marginal increases in household income Downstream: • Doubt as to whether there will be a detectable decrease in sedimentation	• Possibility of further investment – industry and commerce may contribute if there is a trusted intermediary • Payments used for environmental, business and social investments • Some employment generation • 60% of the revenue invested in business ventures to diversify livelihoods • One farmers' group now has a water meter for improved water management
Indonesia: Cidanau watershed	• Sellers: 72 farmers • Buyers: Industries, municipality, commercial sector and harbour through KTI and FKDC as intermediaries	US$15,160 for first two years and US$17,325 for next two years	Upstream: • Each farmer receives the equivalent of ±US$80 per 500 trees planted • 95% of revenue to meet seedling and planting costs; 5% on business ventures to diversity livelihoods (subject to group agreement) • Direct impact low but in the context of falling household income Downstream: • Doubt as to whether there will be a detectable decrease in sedimentation but resolve to continue	• Diverse set of external partnerships • Improved negotiating position with local government departments • Some employment generation • Perceived value of payments is their lump sum nature – hence higher than actual profit after planting • Small business ventures hopeful

Sources: Agarwal *et al.*, 2008; Asquith and Vargas, 2007; Munawir and Vermeulen (2007).

Indirect benefits are diverse and significant. For example, all the Indonesian farmers' groups involved in the schemes have invested in goat breeding, one side-effect of which is planting hedges along terrace lines of dryland fields – providing both fodder and control of soil erosion. One farmers' group invested revenue from the scheme in a successful fodder store while the Brantas farmers have also established tree nurseries necessary for the scheme to be viable small businesses. The Cidanau farmers' groups have developed small enterprises in manufacture of vegetable crackers and vegetable oils (Munawir and Vermeulen, 2007).

In the Kuhan site, indirect benefits from the agreement between the village development committees are largely in the form of increased biomass for use by upstream households, and expanded number of water users and irrigated area downstream (Agarwal *et al.*, 2008). The beehives used in Los Negros have allowed farmers to diversify their livelihoods to include the production of honey for their own consumption and for sale. Several farmers have now had to hire additional labour to help them manage their hives or have entered into other arrangements with landless people (Asquith and Vargas, 2007; Robertson and Wunder, 2005).

In both the Brantas pilot sites and the Bolivian case the payments for watershed services have contributed to the empowerment of previously marginalised communities (Munawir and Vermeulen, 2007; Asquith and Vargas, 2007). In Brantas, the farmers' group was able to negotiate better terms in their agreements with both the state-owned forestry company and the extension services. Although the direct payments are lower than the government's own incentives for reforestation, farmers highlight the flexibility and self-determination that characterises their relationship with PJT1 and the NGO facilitator YPP (Munawir and Vermeulen, 2007). In Los Negros, it has been noted that 'the indirect effects of the PES scheme have been larger and generally more positive'. The reasons given are:

- The formation of four functional environment committees.
- An association of beekeepers.
- Tensions between upstream and downstream communities are lower.
- There is general recognition that watershed management is everyone's issue.

Source: Asquith and Vargas (2007).

Increasing confidence in the upstream communities of Los Negros is also evident in their recent assertions that they do not want financial assistance with honey production if such help is not tied to the programme's goal of conditional development aid for watershed management and conservation. The farmers involved were concerned that donor-funded programmes that provide development

services without such conditionality or reciprocity would actually undermine the communities' increasing sense of environmental responsibility (Asquith, personal communication).[21]

One of the most important findings from the project is the heightened sense of rights and responsibilities that seems to develop through PWS schemes. This is apparent in the ways in which local communities in the Indonesian, Indian and Bolivian case study sites have begun to engage with the process. There is a sense from the case studies in these three countries that the benefits derived through contracts have a higher value than those from government handouts because they are not obligated to the same extent (Munawir and Vermeulen, 2007). Thus experience begins to suggest that PWS can be empowering, with people moving from being passive recipients of development assistance to active participants in their own development through the agreements or contracts to which they are party.

This sense of empowerment may extend to addressing inequities within the communities themselves. In the case of Los Negros, when those outside the local power elite engaged voluntarily in the project there was a backlash from the elite, who attempted to throw out the project from the upstream community. Following representations to the provincial government, the project was reinstated. The local municipality then went further and bought into the PWS scheme by contributing municipal funds. The acceptability and local legitimacy of the scheme subsequently increased and local power elites were less able to undermine it. Although in this case the municipality seems to command a higher level of respect than is the norm, the possibilities for spread and replication of the approach are nonetheless strong. In the case of Kuhan, investing in catchment protection upstream led to a rethink of membership criteria and water charges for the irrigation scheme. Development of multiple categories of membership and a revision of the water charges helped raise the water users from 8 to about 50. It is unlikely that this would have happened without the stimulus and empowerment provided by the negotiation process.

Indirect benefits may also be felt by the landless. Although they may have no formal land rights such individuals and user groups often have access rights that are locally and/or legally recognised. Spin-off benefits from payment mechanisms may create positive benefits for some people from amongst the poorest sections of a community. For example, poor people are now involved in increased non-timber forest products collection in arrangements struck with the forest service linked to farmers' conservation of water springs at the Brantas site (Munawir and Vermeulen, 2007). In Los Negros, the PWS scheme has created a 'secondary market' for beehives through some farmers selling their hives to landless people in the valley; other farmers have hired landless labourers to help harvest and process the honey (Asquith and Vargas, 2008).

21. Nigel Asquith personal communication, November 2006, Cape Town, South Africa.

Neutral or negative impacts from payment systems linked to land access can also be discerned. Within the Caribbean, several governments have developed fiscal instruments that resemble payments for watershed services. Because many of these are in the form of tax rebates for certain land-use practices, they are seldom applicable to the poorest sectors of society who are generally squatters with no land rights and off the radar screen of the tax authorities (McIntosh and Leotaud, 2007).

The activities within the action-learning sites and the diagnostic studies in Bolivia and China have shed little light on the question of the impact of PWS on poor households where they have to pay for watershed services. In the three action-learning sites that developed financial transactions, there was no impact on poor water users. In Indonesia the payments come from a government-owned industrial conglomerate (KTI) and the management body of the Brantas catchment (PJT1). In Bolivia the beehives (and then more latterly the barbed wire) were purchased with money from a US donor with some contribution from the local municipality (Asquith *et al.*, 2008). At Kuhan, where downstream farmers paid for the exclusion of livestock, there is no evidence to show that this had a negative impact on these buyers (Agarwal *et al.*, 2008).

The diagnostic work in China provided insight into a national PWS programme and its impact on livelihoods. The Chinese government's Sloping Lands Conversion Programme (SLCP) is, by any measure, the largest PWS scheme in the developing world (Bennett, 2008). Under the programme, the government pays farmers to stop cultivating on steep slopes. It is estimated that 53 million farmers are receiving compensation or payments to stop cultivating annual crops on 'unsuitable' land. At a macro-level the gross economic impact of the programme is impressive. For example, the stock of standing trees has increased by 38 per cent to 990 million m^3; the annual value of timber produced is over US$2 billion (17.53 billion yuan); and an estimated 6 million homes are provided with fuel wood (Sun and Chen, 2006b).

An accurate assessment of the livelihood impacts of the SLCP is extremely complicated because of its sheer scale, the amount of money involved, and the variations across programmes and provinces. Sample surveys from three provinces in the Yellow and Yangtze river basins show that the gross payments exceed the median opportunity costs of cultivation forgone by the farmers.[22] However, elsewhere there is evidence that farmers are not being sufficiently compensated for the short-term opportunity costs of giving up growing grain crops (Bennett, 2008). For example in Gansu province almost 50% of surveyed households indicated that there was a decline of household income compared with before

22. For example, in Sichuan Province the payment was US$417/ha/yr and the median opportunity cost estimated at US$358/ha/yr. In Shaanxi Province the payment was US$290/ha/yr and the median opportunity cost estimated at US$81/ha/yr (Xu and Cao, 2002).

the implementation of the programme (Bennett, 2008). More worryingly, from an implementation perspective, there are systematic shortfalls in the benefits actually received by farmers for giving up cultivation due to deductions by institutions at higher levels (Bennett, 2008).

Farmers are traditionally very conservative and the rates of adoption of new technology are generally very slow. Yet surveys have shown a high rate of uptake – some 70 per cent to 90 per cent in selected counties (Xu and Cao, 2002). These rates tend to support the survey data, which show that the payments in two provinces surveyed exceeded the average opportunity cost of the land-use changes. However, the SLCP is also known for the rent-seeking activities of bureaucrats at all levels, the competition and appropriation of resources by different departments, and various instances of coercion (Bennett, 2008; Sun and Chen, 2006b). It is interesting to note that during the project the Chinese government formally recognised the role of payments for land-use change as an important instrument in addressing the growing inequity between urban and rural areas (Li *et al.*, 2007).

However, due to the sheer scale of the SLCP there are also indications that in some counties the combined package of coercion, cash and grain incentives has impoverished farmers, causing them to leave their lands (Sun and Chen, 2006b). This highlights the potential problems for poor people of programmes imposed as blueprints rather than negotiated as locally-workable agreements (Bennett, 2008).

In South Africa, no payment mechanisms were developed at the action-learning sites. However, in the context of local livelihoods the evolving policy situation is instructive. Since 1994 there has been a major national policy drive to address poverty and to right the wrongs of the apartheid years during which Africans were marginalised, manipulated and forcibly resettled into fragmented homelands. Given this history, a substantial redistribution of wealth, land and productive assets will be required to erase the inequalities that were created. In the context of payments for watershed services, it is explicitly acknowledged by some that the short-term political and economic imperatives for the redistribution of wealth will outweigh longer-term objectives such as sustainable land, water and natural resource management (Quibell and Stein, 2005).

The Working for Water Programme (WfW), which is predominantly a government programme, has the twin objectives of watershed management and a poverty relief public works programme. Since the programme's inception in 1995, almost 1 million hectares of alien vegetation have been cleared, with an imputed increase in streamflow of 46 million m^3 per annum. Furthermore, the programme has provided employment to 24,000 previously unemployed persons (Turpie *et al.*, 2008).

In summary: our project's results show that direct impacts on the livelihoods of farmers in the pilot sites from the nascent payment mechanisms are marginal. This suggests that PWS is not yet a tool for widespread and far-reaching poverty alleviation. The results also indicate that developing PWS relationships can lead to important indirect benefits such as improved social cohesion, self-determination and new entrepreneurial relationships. The analysis has also shown that poverty within a watershed is often a function of long legacies of injustice that only a large-scale reallocation of assets is likely to address (for example in South Africa and Indonesia).

3.1.3 Changes in land use

It is premature to venture any robust statements about the environmental impact of the payment mechanisms developed at the action-learning sites, since the schemes are in their early stages. The spatial scales of the land-use changes facilitated by the project are:

- Bolivia; Los Negros: maintenance of over 3,000 ha of forests.
- Indonesia; Brantas: replanting of 40 ha of critical land.
- Indonesia; Cidanau: replanting 50 ha of critical land.
- India; Kuhan: 12 ha of grazing land closed for rehabilitation through planting.

Of the four sites where transactions occurred, the maintenance of over 3,000 ha of forest on the steep slopes of the Los Negros catchment stands out as a tangible achievement (Asquith and Vargas, 2007). However, it is difficult to give categorical answers to questions about the level of threat to these forests and the outcome if no payments had been made.

Some of the PWS literature and models tend to oversimplify land-use–watershed service relationships – the very basis upon which PWS schemes are built (Calder, 2005). As with livelihood issues, simplistic notions of a core problem that can be rectified by a change in land use seldom do justice to the reality on the ground – which is characterised by competing interests and complex issues of scale.

At many of the action-learning sites there appeared to be widespread consensus, albeit subjective, on the core problem and the changes in land use that were needed. However, further exploration of the hydrological relationships was often constrained by: the availability of skilled hydrologists; insufficient time-series data at the scale required; and, in one case, great reluctance by government officials to make public existing data on water quality. Consequently the land-use and hydrology reviews that have been carried out in the project countries and sites have generally been limited to reviewing existing data sets and are therefore constrained by the accuracy and length of these, as well as by the skills of the hydrologists involved (see, for example, Asquith and Vargas, 2007). The complexity

of the relationship between land use and both water quantity and quality is generally highlighted by these reviews. Causal quantified relationships between land use and indicators of water quality and/or quantity have been very difficult to establish – hydrologists are in short supply, calculations are demanding, and data collection and analysis is costly.

Vested and competing interests are another problem. Two good examples from the Bhoj Wetlands action-learning site illustrate this. Firstly, the wetlands are subject to very high levels of solid, chemical and bacterial pollution from both urban and rural sources. Some of these sources are known (point source pollution) while others are more general and associated with land use (non-point source pollution). The multiple sources of pollutants means that it has not been possible to specify the precise links between farming systems adjacent to the lake and particular agricultural chemicals. In addition, information on water quality is aggregated and is only released publically at the discretion of the Lake Conservation Authority. Secondly, advocates of a plan to construct a pipeline from the Narmada River to supplement Bhopal City's water are pushing ahead, despite preliminary calculations indicating that this could well be more costly that treating existing supply from the Bhoj Wetlands, because of the preference for large supply side engineering projects that can deliver large quantities of water upon completion (Agarwal *et al.*, 2008).

Proponents of ecosystem services and incentives for watershed management seldom deal well with the challenges associated with scale. The challenges of scale in part explain why many of the hydrological surveys undertaken during the project were inconclusive. Measurable changes in the main water flow parameters, such as average peak and base flow resulting from land-use change, are largely confined to catchments of less than 100km^2. At scales of more than 100 km^2, changes in land-use practice are 'either attenuated by intermediate processes (e.g. sediment deposition) or lost amidst the background noise caused by spatial and temporal variability in rainfall across the watershed as a whole' (Frost, 2004). For the same reasons, changes in water quality as measured by sediment load and/or organic matter are not detectable above 100 km^2. This means that at the scale of the Brantas River basin (12,000km^2), only changes in salinity, pesticide levels or heavy metal content could be causally attributable to changes in land use.

Of the project sites, the clearest land-use–water quantity relationships appear to be those of the upper Ga-Selati River, South Africa. It has been estimated that clearing the invasive alien species from the upper catchment would improve the flow in the river by about 1.67 million m^3 per annum (Chapman, 2006). Further increases of 280,000m^3 per annum in streamflow would be possible if the efficiency of irrigation in a government irrigation and resettlement scheme were improved. These initial findings were very important for the next steps in the approach. Initially, the mining

complex at Phalaborwa had been identified as a potential buyer of additional water. However, the hydrological study revealed that despite the additional water, it would be unlikely to have significant effect on the flow in the Ga-Selati at Phalaborwa, principally because of the large number of dams and weirs constructed by farmers along the length of the river. These results led the project team to refocus on establishing a PWS mechanism between the Legalametse Nature Reserve and potential buyers in the upper catchment.

Box 8

Hydrology and land use in the Ga-Selati River catchment

The Ga-Selati is a small river that rises in the Legalametse Nature Reserve (20,000 ha) in the Limpopo Province of South Africa. On average, river flow is 9 million m^3/annum in the upper catchment and 43 million m^3/annum in the middle and lower catchment. It is estimated that 60 per cent of all the water abstracted from the upper river and its tributaries is wasted due to poor equipment and wasteful practices. Waters is also prevented from reaching the lower reaches by 40-plus illegal dams and weirs.

Downstream water users, including irrigators, commercial wildlife producers and mining operations would benefit considerably from more water. Removal of the invasive alien species and the restoration of grassland in the upper catchment would save 1.67 million m^3 of water annually. Unchecked growth and expansion of these invasive alien species will consume a further 3.8 million m^3 of water annually. Removal of a low-yielding orchard and improvements to irrigation infrastructure would save a further 0.3 million and 7.1 million m^3 of water annually.

Sources: Chapman (2006); King *et al.*, (2008).

In Saint Lucia, the hydrological study considered land use – water quality issues within the relatively small Talvan catchment (about 3.2 km^2). A participatory Talvan Water Catchment Group has been active in the area, aiming to get farmers to recognise their impacts on water quality and to work with them to make improvements. The group has benefited from some aid funding channelled through the Forestry Department. While survey evidence shows that public awareness on the issues has increased, there is little evidence to prove whether impacts on water quality are real. In effect, changes in land management have been paid for, with little certainty that the expected environmental service will result (Cox, 2004).

The two sites in Indonesia challenge the conventional wisdom that buyers of watershed services need tangible proof of the service that they are buying. Hydrological surveys were not required to stimulate payments from PJT1 and KTI for tree planting at the pilot sites (in the Brantas and Cidanau catchments respectively). Munawir and Vermeulen (2007) suggest that this is because: i) culturally, trees are seen as the natural vegetation of Java; ii) administratively, conservation is the mandate of the Forest Department; iii) practically, tree planting is easy and does not require external technical assistance; and iv) politically, farmers often have little say in what happens to the land that they use.

In the three Indian sites, data and the perception on hydrological processes played an important role in the different outcomes. In the Bhoj Wetlands, the aggregated water quality data meant that the relative impact of the different sources of pollutions could only be broadly estimated. In Kuhan, the joint transects through the catchment, the development of erosion potential maps and the presence of a local hydrologist played an important role in building confidence and getting agreement on the area that was closed to grazing. At Bhodi-Suan, the rapid hydrological survey failed to convince communities that upstream closure could increase water flows. This decision was strongly influenced by a previous closure, a decade ago, that failed to increased water flow.

In summary: the land-use changes and the permanence of the PWS schemes stimulated in the course of this project look positive, but judgement is premature. The hydrological effects of particular land-use actions are often in practice hard to pin down due to inadequate or inaccessible information and complications of geographical scale. In this context it is unsurprising that perceptions about watershed service provision are at best only one of many factors involved in decisions about upland land use. Interrogation of these perceptions may be the key additional function that PWS schemes look to provide.

3.2 Findings from the international case study review

The 2002 review of payments for ecosystem services by IIED focused on the evolution and structure of markets for ecosystem services and their impacts on human welfare (Landell-Mills and Porras, 2002). The review highlighted that:

- The evolution and structure of markets for ecosystem services was poorly understood.
- There was little evidence of the impact, either positive or negative, that payments and markets were having on poor households.
- Payments for watershed services were more likely to be developed through negotiation between stakeholders than by the emergence of a market characterised by competition, supply and demand.
- There was a growing willingness to pay for changes in land use because of a greater understanding of land-use–water relationships and the growing threats to the supply of watershed services.

In updating this review a sample of some 123 payments for watershed services initiatives or 'PWS case studies' in developing countries were identified by IIED (Porras *et al.*, 2008). Of these 123 cases examined, 73 were excluded from the statistics because they were either borderline in terms of the PWS definition or there was insufficient information in the public domain to include them in the final analysis. The review also identified a further eight 'advanced proposals' and 37 'preliminary proposals' for PWS schemes.

Surveys (or reviews like this) that are based on secondary sources face several methodological challenges. The first is in trying to understand the sample and the extent to which the final set of cases 'represents' the real world. The second is that there are issues of scale, especially in the presentation of statistics. Both the 2002 and the current reviews analyse and generate simple descriptive statistics based on the 'number of initiatives' as the primary metric. This means that the Chinese government's Sloping Lands Conversion Programme (SLCP), which deals with 53 million farmers over 17.34 million ha and has cost US$7.6 billion (Sun and Chenb, 2006), has the same weight as the Los Negros Project in Bolivia, with 34 farmers, 3,000 hectares and a total cost of US$23,000 (Asquith and Vargas, 2007). A third challenge is that of confirmation bias: project managers, not external and independent analysts, produced much of the information that was used to compile the case studies (Porras *et al.*, 2008).

What has happened since 2002? *Silver Bullet or Fools' Gold?* identified a growing willingness by the beneficiaries of watershed services to pay for watershed protection (Landell-Mills and Porras, 2002). Revisiting 42 of the developing country initiatives identified and analysed in 2002 shows that there are still substantial hurdles to overcome in implementing the concept. For example, 9 out of 17 the initiatives classified as 'proposals' in 2002 have 'failed' or are of 'uncertain status' (Table 4). Of the remaining eight, four are still 'ongoing' while a further three remain as 'proposals'. One proposal has been reclassified as a borderline case. Similarly, of the 25 proposals considered to be 'ongoing' in 2002, 11 have been 'abandoned' or are of 'uncertain status'. Therefore, from the overall sample of 42 initiatives only 18 (15 ongoing plus 3 proposals – 44 per cent) can be considered to still be 'active', implying that 21 (51 per cent) of the initiatives reviewed in 2002 have been abandoned or are of uncertain status. A further three (5 per cent) have been reclassified.[23]

Precise reasons for these failures are difficult to ascertain (because failures are seldom written up), but they include: an absence of political support; limited demand for watershed services; political upheavals; other priorities; and a sense that the proposed mechanisms were too complex to be implemented (Porras *et al.*, 2008). However, it should be noted that the terms 'abandoned', 'failed' and 'uncertain status' have been used with care – the figures on these initiatives paint a picture of PWS schemes in developing countries generally being in the early stages of evolution and often lacking the necessary robust and cohesive institutions and skilled people.

23. Comparable figures with other similarly complex environment and development projects are hard to find. A review of forest enterprises from east and southern Africa showed that that closure rates exceeded 10% per year and that 50% of businesses closed by the end of their third year of operation (Arnold *et al.*, 1994).

Table 4 **Current status of 42 of the PWS initiatives identified and used as case studies in 2002**

Initiatives	Number in 2002	Number and current status of initiatives
Proposals	17	• 10 failed or uncertain status • 3 are ongoing • 3 are still proposals • 1 reclassified as a borderline case
Ongoing[1]	25	• 11 abandoned or uncertain status • 12 are ongoing • 0 proposals • 2 reclassified as borderline PWS cases
Total	42	• 21 abandoned or uncertain • 15 ongoing • 3 proposals • 3 reclassified as borderline PWS cases

1. Ongoing' refers to mature and pilot cases
Source: Porras *et al.* (2008).

3.2.1 Payments and payment mechanisms

Exploring the fate of the 2002 sample of initiatives highlights the challenges in developing payments for watershed services. But the main objective of the current survey was to provide a reference point against which to triangulate the experiences and lessons from IIED's partners and their action-learning sites. The analysis of the selected cases provides a perspective from across developing countries on issues such as the geographical spread and evolution of PWS mechanisms, the types of payments being made, how payments are being made, and their impacts on livelihoods and their environmental impacts.

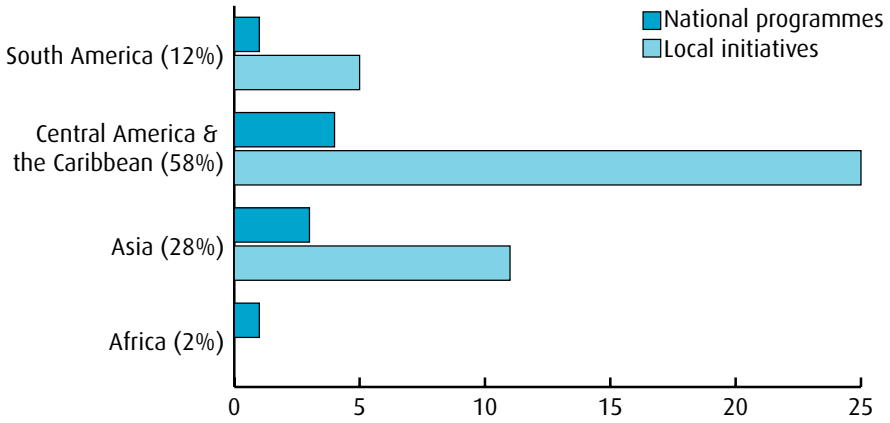
Where are PWS mechanisms being developed? The sample of initiatives and schemes that met the selection criteria and for which there was sufficient available information shows a strong regional bias. Approximately 70 per cent of the sample are from Central America, the Caribbean and South America with the balance being 28 per cent from Asia and 2 per cent from Africa (Figure 3). This differs from the geographical analysis of the previous sample where the cases in developing countries were divided as follows: 52 per cent from Central America, the Caribbean and South America; 37 per cent Asia; and 11 per cent Africa[24] (Landell-Mills and Porras, 2002).

Common to both surveys is the low number of schemes and initiatives in Africa. The regional differences in the uptake of PWS has led Porras *et al.* (2008) to broadly characterise the Caribbean, South and Central America as a region that is 'implementing PWS', Asia as a region that is 'experimenting with and preparing for PWS' and Africa as a region where very little progress is being made with PWS.

24. A further 24 cases from developed countries were included in the 2002 Landell-Mills and Porras sample.

Figure 3

Geographic distribution of local initiatives and national schemes



Source: Porras *et al.* (2008).

Are local-level initiatives increasing? In 2002, 68 per cent of the initiatives reviewed were at the level of the watershed or basin (Landell-Mills and Porras, 2002), the balance (32 per cent) being initiatives at national level. In the current sample, some 82 per cent (41) of initiatives are defined as local while 18 per cent (9) are national programmes (Table 5). The small sample sizes in both surveys prevent rash inferences about changes in the number of national-level initiatives relative to the number of local-level schemes. However, the differences and the distinction between the two approaches to PWS are important, particularly in terms of the source of funding since one of the main reasons for interest in PWS schemes is for their leverage of new funding sources. Payments under national-level PWS initiatives are primarily made from government revenue and therefore do not technically constitute 'new sources of funding' (Wunder, 2005). Local-level initiatives tend to have a higher proportion of private sector finance but are often co-financed by government. Interestingly, the survey noted that there were at least four donor-led, international programmes that aim to facilitate the development of PWS schemes in multiple sites across several countries.

What services are being provided? Watershed services are generally disaggregated into three functions: the quantity of water, the quality of water, and the regulation of flow (Calder, 2005; Bruijnzeel, 2004; van Noordwijk *et al.*, 2004). The analysis of the watershed service being provided by each scheme in the sample is complicated by two issues. Firstly, in some schemes both water quantity and water quality are stated objectives. Secondly, services are also bundled together with other ecosystem services. The results should therefore be broadly interpreted.

Table 5

Examples of local-level initiatives and national-level schemes in the sample

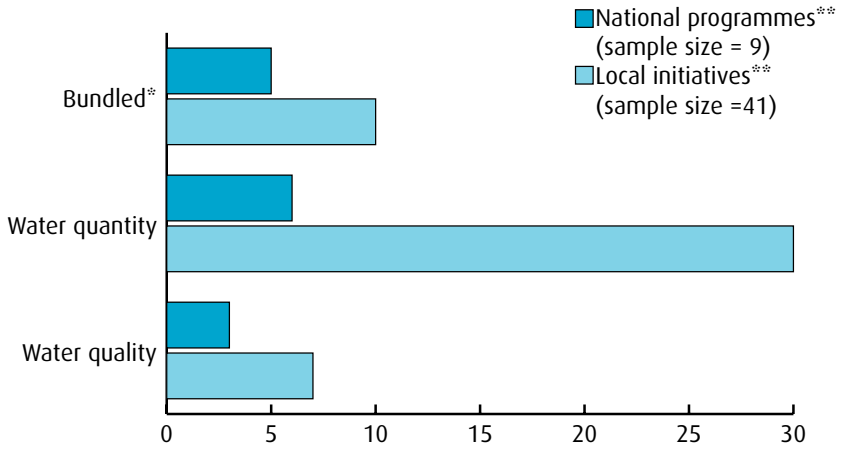
Category of initiative	Sample size	Examples
National initiatives	9	• Sloping Lands Conversion Programme (SLCP), China • Working for Water (WfW), South Africa • Payments for Environmental Services (PSA), Costa Rica • Payments for hydrological environmental services (PSAH), Mexico
Local/catchment initiatives	41	• Los Negros and Tarija, Bolivia • Kuhan, India • Mangla Dam, Pakistan • Mt. Kanla-on, Philippines • Cacau Valley Brazil
Total	50	

Source: Porras *et al.* (2008).

From amongst the local initiatives, and albeit marginally, water quality is the primary service sought by buyers. At the national level, initiatives appear to be less focused on realising a specific watershed service. Governments are generally setting broad watershed conservation goals for these programmes – these include water quality and quantity regulation as well as other broader conservation and poverty alleviation objectives (Figure 4). However, within the sample of local initiatives there are also indications of multiple objectives, although possibly not to quite the same extent.

Figure 4

Watershed services sought by local initiatives and national programmes



(*) 'Bundled' refers to where one or more environmental service is provided simultaneously (Landell-Mills and Porras, 2002). (**) Initiatives may primarily seek more than one service.
Source: Porras *et al.* (2008).

What are the principal drivers of PWS initiatives? In 2002, 52 per cent of the initiatives were demand-led, principally by the belief that 'forests play a critical role in maintaining water quality and quantity' (Landell-Mills and Porras, 2002). Significantly only 8 per cent of the initiatives were considered to have been initiated by suppliers of watershed services. The current review faced substantial challenges in identifying single stakeholders as drivers of PWS initiatives. The development of PWS mechanisms generally evolves over time in response to problems that are being felt by both water users and upstream land managers. Over the last few years there appears to have been an upsurge in the number of programmes and projects that are being facilitated by stakeholders – such as development and conservation organisations – that are not resident within the catchment.

What type of land managers are supplying watershed services? The analysis of the current sample of case studies shows that private land-holders are the primary suppliers of watershed services to both local initiatives and national programmes (Figure 5). One inference that can be drawn is that, in contrast to the difficulty of working with large numbers of people within communally-owned lands, private landholders may more easily secure the necessary control over their land and the incentives to engage with a PWS mechanism and to comply with the contingency requirements (Porras *et al.*, 2008). The only substantive example of communal landowners benefiting from PWS is the PSAH Programme of the Mexican government. Under the programme, payments are made to the 'Ejido Assembly' on behalf of its members. This option was chosen because there was more legal support for the Ejido[25] being the forest owner. The challenges associated with common ownership of land may explain why so few PWS schemes have been developed in Africa, where land is generally communally owned but under overlapping and sometimes contradictory mix of traditional and modern policy and legislation.

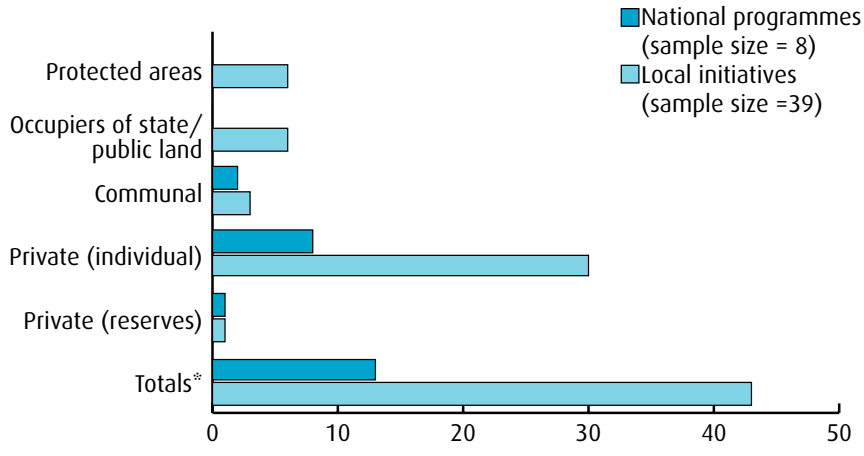
The other categories of tenure included in Figure 5 reflect the small sample size and the diversity and complexity of classifying land tenure. As in the other analyses, the data are complicated by some of the initiatives in the sample being implemented in situations with multiple land tenure systems (Porras *et al.* 2008).

Who is paying for watershed services? Advocates of PES argue that when operational they are a more reliable and regular source of 'conservation' funding than typically provided by governments under more traditional funding mechanisms (Engel *et al.*, 2008; Wunder, 2005; Pagiola *et al.*, 2005). The examination of the case studies shows that funding to PWS schemes is seldom from a single source – many of both the local and national initiatives have multiple sources of funding. Support

25. An Ejido refers to land that is communally managed by formerly landless people in Mexico. It was introduced through changes in the Mexican Constitution in 1917 and operationalised in 1934. The members of the Ejido have user rights rather than ownership over the land (http://en.wikipedia.org/wiki/Ejido).

Figure 5

Suppliers of watershed services by land tenure type



* A few initiatives deal with more than one tenure system
Source: Porras *et al.* (2008).

for PWS programmes can also take two forms, the first being actual payments for watershed services, the second being general support for establishing or facilitating the development of the payments scheme. From the small sample and limited detail available, however, it is often difficult to differentiate the two types of financial support.

There are generally two sources of funding for the national-level programmes – the government itself, and donors (Figure 6). Government funding comes from general revenue in all cases except in Costa Rica where the bulk of the revenue is derived from a 3.5 per cent tax on fuel that the government has committed to using to pay for watershed management[26] (Pagiola, 2008; Porras *et al.*, 2008).

The situation amongst the local initiatives is much more complex and is characterised by multiple sources of funds. The evidence suggests that private sector funds are limited and certainly have not developed as expected. Where private sector funds are in place, these appear to be corporate social responsibility-type payments, rather than market-based payments for watershed services (Porras *et al.*, 2008).

The *Silver Bullet* analysis identified some 13 different types of commodities that can be used to 'market' watershed services (in both developing and developed

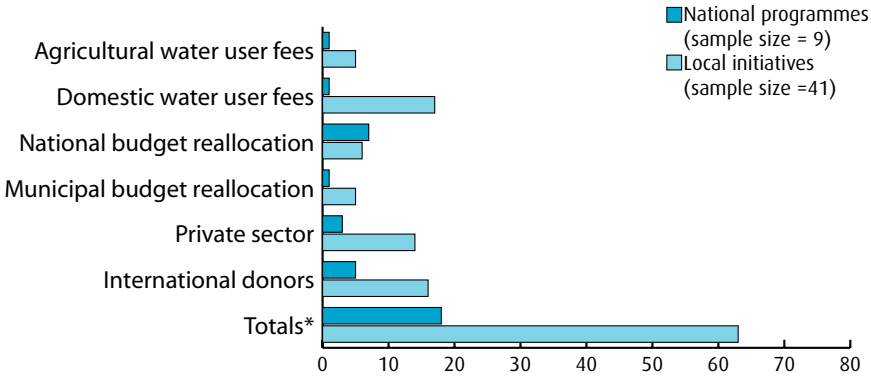
26. Additional funding for the Costa Rican programme has also come from the World Bank and the Global Environmental Facility (GEF) (Pagiola *et al.*, 2008).

countries). These range from simple contracts between upstream and downstream farmers to sophisticated 'secondary instruments' such as 'salmon safe products'[27] (Landell-Mills and Porras, 2002). While the current review (in developing countries) found a complex mixture of funding sources, these were primarily different sources of finance for relatively simple forms of PWS contracts between upstream farmers and downstream water users.

Funding from international and bilateral donors fulfils many roles in both local initiatives and national programmes. Funding, sometimes with technical support from international organisations, is used for example to support transaction costs such as undertaking feasibility studies and building capacity. Some support is considered to be transitional until government and/or private sector funds are in place.

Figure 6

Main sources of funding for PWS initiatives



* Initiatives may have several sources of funding
Source: Porras *et al.* (2008).

How are payment levels decided? The 2002 analysis noted that payments for watershed services were most likely to arise out of negotiation between the stakeholders rather than be driven by market forces. However, the authors did predict the eventual emergence of 'supply driven markets' with increasingly sophisticated commodities and payment mechanisms (Landell-Mills and Porras, 2002). Yet there is little evidence within the current sample to suggest that markets are leading to the creation of PWS initiatives in developing countries.

27. These are arrangements where the farmers who invest in land management practices that are sensitive to the water quality needs of salmon are rewarded with premiums in the market (Landell-Mills and Porras, 2002).

In the absence of competitive markets with many buyers of watershed service, the levels of payment are either determined through negotiation between stakeholders or are set administratively (Table 6). Overwhelmingly, payments under the national programmes are predominantly set administratively. The one exception is the Ecoservicios Scheme in El Salvador, where there have been negotiations between government and the farmers – however, it should be noted that this is in the context of a pilot scheme (Porras *et al.*, 2008). In general, national programmes are being implemented at large geographical scales – standardisation is both a means to reduce the transaction costs but also a reflection of the multiple objectives of these national programmes. Within the sample of local initiatives, marginally more are characterised by negotiation (20) over the levels of payment than by an administrative process (or no negotiation) (18) (Table 6). Again the emphasis from the sample appears to be on simple arrangements as there are no examples of more sophisticated instruments for price determination such as trading and auctions, as was found in the 2002 survey (during which there was a general sense that more sophisticated instruments would soon be more common).

Technically, economic valuation techniques can provide an estimate of the value of the services and can be used as a guideline for either further negotiation or administrative pricing. However, because valuation techniques are complex procedures and frequently challenged, facilitators often revert to estimating the direct and opportunity costs of the changes in land use that the landowner or manager will bear in order to provide the service (Porras *et al.*, 2008). It has been noted that while simplicity maybe appealing from an implementer's perspective, Ferraro (2008) notes that the asymmetrical distribution of information between land managers and buyers of environmental services may lead to inefficient outcomes in emerging PES programmes. This contradicts the underlying premise that PES mechanisms are more efficient that other conservation tools (Ferraro, 2008).

Table 6 **Distribution of negotiated and administratively set prices in local initiatives and national programmes**

Method of price setting	Local initiatives (sample size = 38)	National programmes (sample size = 9)
Administrative	18	8
Negotiation		
• Direct between buyer and seller	3	0
• Through NGO as intermediary	13	0
• Through government as intermediary	4	1
Other, including trading systems and auctions	0	0
Totals	38	9

Source: Porras *et al.* (2008).

What kinds of payments are being made, and how often? The evidence from the cases is that the type of payments (cash, in-kind, etc.) and their frequency vary considerably between schemes. Theoretically, payments to farmers need to be regular otherwise there will be a strong incentive to return to previous land uses (Wunder, 2005). Thus it has been noted that 'if the externality underlying PES is permanent, as for instance will apply to most cases of forest conservation, there is no reason to believe that a service will be provided after the payments end' (Wunder *et al.*, 2008).

There is also some debate about the use of cash payments directly to farmers – this is an issue that has been raised before in the conservation and development discourse (Hulme and Murphree, 2001; Child, 2004). It is argued that cash payments may not be effective – they may be captured only by men, and/or cause social distress and myopic spending. Conversely, there are strong arguments that suggest that development is best achieved through the provision of truly discretionary funding to poor people, which means making payments in cash and allowing the beneficiaries decide how to spend the money (World Bank, 2002).

The evidence from the cases reviewed shows that about 50 per cent of local initiatives make regular cash payments to farmers and land managers. For national-level programmes, regular cash payments are more frequent than in-kind payments (Table 7). Interestingly, the majority of these examples are in Central America (Costa Rica and Ecuador) although other examples are found in Indonesia and India. Cash payments do have many advantages. These include: making a tangible link between buyer and suppliers; reinforcing the idea of compliance; and being relatively easy to manage. Generally, where regular cash payments are being made, these are simple flat rates per unit area. The only example of differentiated cash payments in a national programme is in Mexico, where the government pays a higher rate for the conservation of cloud forest than it does for forest at lower altitudes (Munôz-Pina *et al.*, 2008).

Outside Central America, the review found various types of in-kind payments being used. Examples include: seedlings for reforestation (Brazil, Ecuador, the Philippines); technical advice (the Philippines, Honduras and Ecuador); and improved land tenure (Indonesia). Non-financial transfers are often useful when there is cultural resistance to the commoditisation of natural resources, or the suppliers of watershed services are more interested in the non-financial benefits.

The review also shows that from within the sample of local initiatives, most of the payments (+/- 75 per cent) were made to the farmers through an intermediary organisation. For example, the Costa Rican power utility, CNFL, which operates several hydro-electric power stations, sub-contracts PWS functions to FONAFIFO

Table 7

Type and frequency of payments made

Type of payments	Local initiatives (sample size = 38)[28]	National programmes (sample size = 8)[29]
In-kind and one-off	12	3
In-kind and periodic	1	1
Cash and one-off	3	1
Cash and periodic	20	6
Totals	36	11

Source: Porras *et al.* (2008).

– the organisation that also deals with the government payments. In about 25 per cent of the cases examined, payments were made directly to farmers by the buyers of watershed services. Again in Costa Rica, the water utility Empresa de Servicios Publicos de Heredia (ESPH – Public Utilities Company of Heredia) both collects water fees from users and makes payments to land managers in catchment areas. However, the cases of direct transfers usually involve relatively few land managers and a single downstream buyer.

The data indicate that intermediary organisations have a significant influence on PWS mechanisms. They are often involved in all stages of the development of the PWS mechanism and may have further roles in the disbursement of payments. The integrity, neutrality and accountability of these organisations to both the buyers and sellers of watershed services may well determine the long-term viability of PWS schemes. Intermediary organisations are also becoming the gate-keepers of environmental trust funds that are being used to make payments (Porras *et al.*, 2008).

What are the changes that are being paid for? Under both the national programmes and local initiatives, payments are being made to farmers and land managers to change their activities in order to achieve certain objectives in terms of water quality and quantity. From the analysis of the cases, four broad categories of land-use change (or in one case 'no change') have been identified. These are (Porras *et al.*, 2008):

1. Restoration: activities that lead to the recovery or rehabilitation of degraded ecosystems that will produce an environmental service.

2. Conservation: conservation of existing land cover and ecosystems (no change).

28. Excludes Lake Toba and San Jeronimo (no payments to landholders) and Morazan (no information).
29. Excludes the WfW programme in South Africa

3. Reforestation: largely of commercial plantations.

4. Improved land management: a range of improved land management activities primarily in areas of settlement and cultivation.

Within the small sample of national-level programmes, each of the four categories is almost equally represented in the sample (Table 8). Within the local initiatives, the improvement of land management practices (27 cases) within existing agro-pastoral systems and the conservation of existing indigenous land cover (23 cases) are the primary changes that are being sought by PWS mechanisms. As expected, the actual land-use changes within the category of 'improved land management' are diverse and reflect the context and the sites involved. However, the changes that are being made include: soil and water conservation techniques; alternatives to shifting agriculture; switching from inorganic to organic farming systems; the introduction of shade coffee (PSA in Costa Rica and Jesus de Otora in Honduras); and improved ranch management (Silvopastoral programme, Costa Rica, Columbia and Nicaragua).

Table 8 **Land use changes being made by farmers and land managers**

Changes in land use	Local initiatives (sample size = 39)	National programmes (sample size = 9)
1. Restoration of degraded systems	3	4
2. Conservation of existing systems	23	3
3. Reforestation of commercial plantations	11	5
4. Improved land management	27	4
Totals	64(1)	16(1)

(1) Initiatives and programmes may seek more than one change in land use
Source: Porras *et al.* (2008).

From the total sample, there are 26 cases in which payments are being used to conserve existing ecosystems. Costa Rica and Mexico provide two important examples: in Costa Rica, over 80 per cent of the PES payments are for the conservation of existing forest; in Mexico, the government's programme (PSAH) is directed at forest conservation in areas that are considered important to groundwater recharge. Within Costa Rica, there are also several initiatives that are focusing on the conservation of existing ecosystems such as CNFL – Compañía Nacional de Fuerza y Luz, a private company (but majority-owned by the state utility company, Costa Rican Institute of Electricity, ICE).

In summary: this review of 50 payments for watershed service schemes has shown us that PWS, as a tool, is still in its infancy. PWS schemes do fail, or to put it another way the failure of PWS schemes to develop and become self financing is significant. Where they are being developed, PWS are being used to address problems with the quality of water and the quantity of water through a variety of changes in land use – restoration, conservation, reforestation and improved land management. It is, however, clear that fully developed markets for watershed services are a long way off, particularly in developing countries.

3.2.2 Livelihood impacts of payments for watershed services

Regarding the impact of PWS on the livelihoods of poor people, the 2002 review concluded that: 'the superficial nature of impact analysis extends to evaluations of costs and benefits to poor households. For the most part, little or nothing is said on the topic' (Landell-Mills and Porras, 2002). The authors argued that the asymmetrical access to information and to skills, which penalise the suppliers of services, are the two major constraints limiting the benefits to poor people from payments for watershed services. However, it is also important to recognise that for at least some PES schemes, poverty alleviation is not an objective and therefore cannot fairly be deemed to be a measure of performance (Wunder *et al.*, 2008).

In addition to collecting secondary information on the evolution, development and structure of PWS schemes, the current review offers some opportunity to assess the impacts of the case studies on livelihoods and poverty. Generally, the analysis of the impact of PWS schemes on livelihoods is constrained by time-limited data sets. This is because PWS is a recent innovation and the schemes lack extended and critical time-series analyses on their impact. Frequently, where *ex-poste* studies have been carried out they tend to focus on the suppliers of services rather than all the stakeholders, thus limiting the opportunities for exploring the wider indirect benefits and impacts of PWS (Pagiola *et al.*, 2005). Again, the potential for confirmation bias needs to be recognised because most of the material is in the form of case studies, written either by PWS advocates or facilitators of PWS schemes (Porras *et al.*, 2008).

What are the impacts on the suppliers of watershed services? The evidence from this review shows that private landholders are the primary, but not the only, beneficiaries of both the local initiatives and national programmes (see Figure 7). In most cases the beneficiaries of PWS schemes are people who legally own land or have *de facto* rights over land. Therefore, where poverty and the lack of access to land or land ownership are closely related, PWS initiatives will not address the needs of the poorest people in society (Grieg-Gran, and Bishop, 2004).

Notwithstanding the close relationship between access to land and poverty, many schemes do provide positive benefits to relatively poor rural households (Table 9). Good examples of people benefiting are to be found in the local schemes in Honduras (Jesus de Otoro) and El Salvador (Yamabal, Tacuba and Chalatenango). It is clear that some initiatives also benefit farmers whose incomes are generally higher than national averages. For example, the average income of the 13 farmers in the Los Negros scheme in Bolivia is about US$1,000 (in 2004), which is much higher than other parts of Bolivia (Robertson and Wunder, 2005; Asquith *et al.*, 2008).

The experience with national-level schemes is also mixed. This is exemplified by the comparison of the Mexican and the Costa Rican programmes. Under the national PWS scheme in Mexico (PSAH), 78 per cent of payments have been made to people who live in population centres that are either highly or very highly marginalised from mainstream economic development (Munôz-Pina *et al.*, 2008). In contrast, it is estimated that most of the payments made under Costa Rica's national PWS scheme benefited people with title to land, as it was illegal to use public money to make payments to people without title deeds. Recently, however, FONAFIFO has used private funds with similar or parallel contracts to allow land managers without formal title deeds to participate in the national programme. This provides an opportunity for the programme to reach a poorer sub-set of people who, for one reason or another, have not been able to secure title to their land (Pagiola, 2008). These changes will also improve the overall efficacy of the programme by allowing greater geographical coverage in important watershed areas.

What are the impacts on the livelihoods of people who are landless? Typically, analysis of the impact of PWS schemes has focused on those who are receiving the payments and not on landless people who may also live within the same community. The distribution and ownership of land is therefore critical to the potential poverty impact that a PWS scheme may have (Pagiola *et al*, 2005). There are mechanisms by which landless people can participate in PWS schemes. For example in Sukhomajri, India, landless people were assigned water rights that allowed them to participate in a PWS scheme – but this was in an unusually homogenous community and has been hard to replicate even within India (Kerr, 2002).

Working for Water (WfW) in South Africa specifically targets people who are landless and unemployed – providing them with work clearing invasive alien species whose spread, particularly in montane grasslands, is causing a reduction in streamflow. The programme has provided work for 24,000 unemployed or under-employed people annually, the majority of whom are women (Milton *et al.*, 2003, quoted in Turpie *et al.*, 2008). This means that the programme has been funded by government poverty alleviation funds rather than from conservation budgets (Turpie *et al.*, 2008).

What are the impacts on those who are paying for watershed services? While the review found that 15 local initiatives and one national programme had resulted in increased water user fees, there are only five examples where the impacts have been analysed (Porras *et al.*, 2008). In these cases, there has been very little financial impact on water users. It is reported that for three schemes the increase in user fees amounted to between 0.01 per cent and 0.04 per cent of total income (Kosoy *et al.*, 2005 a and b, quoted in Porras *et al.*, 2008). This is because the charges are set very low compared with the rates that the water users are willing to pay. For example, in Costa Rica, the willingness to pay for watershed services was estimated to be three times higher than the actual environmental charge added to the bill.

In Nicaragua, safety nets have been developed to protect the poorest consumers from the adverse impacts of the increases in water fees. The safety net provides free water for the poorest, and in another example creates opportunities for poor people to contribute labour instead of making cash payments (Pérez, 2005, quoted in Porras *et al.*, 2008).

In summary: there were real and legitimate concerns that the rapid development of markets and payments for ecosystem services could have a detrimental impact on poor people. This review has shown that the primary beneficiaries of PWS schemes are farmers with land for whom the benefits have, in general, been modest. The poorest are often also landless and therefore do not benefit to the same extent. There are innovative programmes, such as WfW in South Africa, that have found ways to ensure that the poor and landless do benefit, largely through employment.

3.2.3 What are the environmental impacts of payments for watershed services?

The review of case studies highlights an interesting paradox – while the main stated objective of the national programmes and local initiatives is addressing environmental problems, there is little or no robust assessment of the environmental impacts of these programmes. One reason for the paucity of data seems to be the methodological problems involved in trying to quantify the environmental impact of PWS initiatives.

Land-use and water relationships are complex, non-linear, and highly variable, both spatially and over time. The understanding of the relationship between the land – and in particular land cover – and water is often shaped by deeply entrenched myths (Calder, 2005; Bruijnzeel 2004). To assess the impacts of PWS and land-use change on water quality and water quantity, long and accurate data sets are necessary. Too often these are unavailable in developing countries, or if they are available the data sets are often too coarse to be of much use at the sub-catchment level (Porras *et al.*, 2008). Porras *et al.* note: 'During this review it was difficult, and many times impossible, to find strong scientific evidence of the impacts. There are few examples, if any, of PWS schemes that consistently measure and monitor the delivery of watershed services.' However, there is a general increase in the understanding of the relationships between

Table 9

Examples of financial benefits to households

Category	Country	Study	Scheme	Finding
National	Mexico	González (2005)	PSAH	73% of small private land-holders, and 80% of ejidos members, reported that PWS payments were important for their annual income
	Costa Rica	Ortiz M. *et al.* (2003)	National level	9% of sample reported that PWS represented more than 10% of their income; 67% of sample reported that PWS payments represented less than 10% of their income; 13% reported PWS payments had no effect on their income
	Costa Rica	Miranda *et al.* (2003)	Virilla watershed	On average, PWS payments represented 16% of annual household income
	Costa Rica	Kosoy *et al.* (2005b)	ESPH Scheme, Heredia	60% respondents reported PWS payments represented less than 2% of gross income; 30% of respondents reported PWS payments represented less than 10% of gross income; 10% of respondents reported PWS payments represented 22% of gross income (n=10)
Local	Ecuador	Echavarría *et al.* (2004)	Pimampiro	Annual PWS payment constitutes 30% of household income
	Honduras	Kosoy *et al.* (2005b)	Jesus de Otoro	3 (out of 4) respondents reported that PWS payments represented less than 1.5% of gross household income
	Nicaragua	Corbera *et al.* (2006)	San Pedro del Norte	Payments are less than 10% of annual income

Source: Porras *et al.* (2008).

land use and water at both the national and the international levels (see Box 10). The extent to which future PWS schemes engage with this evidence will be critical to their performance.

In general there is a sense from amongst the cases reviewed that water flows are improving as a result of PWS. However, for the reasons noted above, there is very little evidence to support these statements and they should be considered as assertions only. Where evidence is produced as 'proof', the scale and the timeframe generally cast doubt on the veracity of the claim (Kosoy *et al.*, 2005a).

Box 9

Problems of 'additionality' and 'leakage'

'Additionality' and 'leakage' are two key problems for PWS.[30] The challenge of 'additionality' arises from the absence of a control, or the full understanding of what would have happened in the absence of the changes wrought by the PWS scheme. Consequently, the 'without PWS' situation is often extrapolated from other sites or historical data sets (Wunder, 2005). Examples of additionality problems include:

- **In Mexico, only 11 per cent of the land under contract in the PSAH scheme in 2003 was considered to be at 'high' or 'very high risk of deforestation'. This figure did increase to 28 per cent in 2004. Nevertheless, the implication is that almost three quarters of the payments are unnecessary if their objective is to prevent deforestation (objectives may include other means to improve watershed services).**
- **In Bolivia, the Los Negros farmers nominate what areas of their land are to be set aside. As payments only cover 2 per cent to 10 per cent of the opportunity cost, farmers nominate steep land that is unlikely to be converted.**
- **In Costa Rica, the PSA programme operates on a 'first come first served' basis, which makes little connection with hydrological priorities.**

The problem of 'leakage' occurs when land users and managers agree to a set of land-use changes, but then displace or go elsewhere with their 'undesirable' practices. For example, when a community of farmers agree a land-use plan within a given area but then go outside of the planned area and clear more land for cultivation – this would be considered leakage.

Source: Porras *et al.* (2008).

Evidence of improved water quality as the desired service is equally sketchy and often anecdotal. For example, the decision of three companies that produce hydro-electric power (CNFL, Energia Global and Platanar) to renew their co-sponsorship of FONAFIFO and the national PSA scheme in Costa Rica is taken as evidence by some that the scheme must have improved water quality. A more cynical view might be that continued support for the scheme is good for the image of these companies and that the costs of sponsorship are easily absorbed.

The 2002 review noted that there were limited data to enable attribution of causality, and substantial problems in doing so (Landell-Mills and Porras, 2002). After five years the situation appears to have changed very little – there is still very limited evidence and data to suggest that payments for watershed services do contribute to improved land management and improvements in either water quality or quantity for downstream users (Porras *et al.*, 2008; Wunder *et al.*, 2008). This also means that it is very difficult to assess other claims about PWS mechanisms – for example, that they can be cost-effective mechanisms (Wunder *et al.*, 2008).

30. 'Additionality' and 'leakage' are terms that have developed around the Clean Development Mechanism (CDM) under the Kyoto Protocol. In that context they are defined as follows: **Additionality** is when there is a positive difference between the emissions that occur in the baseline scenario and the emissions associated with a proposed project. **Leakage** is the indirect effect of emission reduction policies or activities that lead to a rise in emissions elsewhere (e.g. fossil fuel substitution leads to a decline in fuel prices and a rise in fuel use elsewhere). Source: http://www.berr.gov.uk/whatwedo/sectors/ccpo/glossary/page20687.html

Box 10

Land use and hydrology: what links are scientifically proven?[31]

Some land-use–hydrology linkages that are reasonably well accepted scientifically include:

- *Intact natural vegetation cover guarantees optimum streamflow* under given geo-climatic conditions. It also provides optimum regulation of seasonal flows by protecting the soil such that erosion and stream sediment loads are moderated.
- *Intact natural vegetation cover is likely to provide favourable streamflow,* regulate seasonal flows, and limit erosion and stream sediment loads. It can therefore act as a baseline provider of hydrological services against which other forms of land use can be assessed.
- *Montane cloud forests* and related cloud-affected ecosystems such as páramos provide maximum streamflow due to high rainfall, water captured from clouds by vegetation, and low soil-water use due to reduced transpiration given frequent fog.
- *Intact natural vegetation cover does not guarantee protection against floods or landslides,* especially in large-scale watersheds and under extreme weather events, but it does reduce their frequency compared to converted land-use cover. This is particularly the case with respect to flooding in smaller-scale watersheds and for small- and medium-sized storm flow.
- *Removal of old-growth forest at large scales* (1,000 to 10,000km^2) in humid areas reduces rainfall during the transition between wet and dry seasons. The effects are modest averaged over the year (5 to 10 per cent) but are more noticeable during the transition.
- *Removal of forest increases annual water yield* (by 100–800mm for a 100 per cent change in cover) initially and in the short-term; the size of change depends on rainfall and degree of surface disturbance. Subsequent water yield depends on the new land cover.
- *Low flows are increased by conversion of forest to non-forest cover,* provided soil degradation is limited and annual precipitation is ~2,000mm.
- *Low flows are likely to be reduced by conversion of forest to other uses,* if soil degradation has caused overland flow to exceed 15–20 per cent of rainfall. Typically, this degraded stage is reached after prolonged exposure of bare soil, by intensive grazing, by the use of heavy machinery, too frequent or very hot fires, improper tillage regimes, and by the introduction of compacted surfaces such as roads.
- *Reforestation can initially result in less streamflow,* due to the high use of water by growing trees. Reforestation does not re-create the ecological conditions of old-growth forest within the lifespan of most PWS programmes.
- *Reforestation is unlikely to reduce the risk of flooding* to the same degree as the former old-growth forest because the recovery of degraded soils often takes several decades. In addition, the impacts of development (such as roads or housing) on drainage infrastructure are not undone by tree planting.
- *Establishing forest on crop- or grassland leads to reductions in low flows* unless there is a sufficiently large improvement in infiltration after reforestation to offset the extra water use by trees. For example, to compensate for the use of 300mm of extra rainfall by trees, a 30 per cent switch from overland flow to infiltration is needed under annual rainfall of 1000mm/year to break even. This is only likely where surface soils are partly degraded yet deep enough to store the extra infiltrated water.

31. These results were discussed and compiled during the 'Bellagio Conversations' (Asquith and Wunder, 2008) and draw heavily on the summary description in Bruijnzeel (2004).

In summary: from a scientific perspective there is very little quantitative evidence to link PWS to changes in water quality and/or quantity. There are three reasons for this. Firstly, PWS schemes are seldom developed with substantive baselines against which it might be possible to measure change; secondly, in developing countries there is often insufficient monitoring of river and streamflow to allow sufficient data sets to be developed to show causality; and finally, few PWS schemes have been running for long enough to facilitate the type of land-use changes that will lead to substantive impacts on the quality or quantity of water. However, the complexity of land-use and water relationships should not be used as an excuse to avoid PWS-type solutions. Small-scale innovations with a commitment to adaptive management can provide a starting point in many cases.

Photo: Ina Porras

Relationships between land-use and water are often more complex than they seem – but local initiatives can get to grips with them

4 Lessons from experience: on payments, watersheds, livelihoods and sustainability

Action-learning is a messy business. People try things and sometimes fail. An unexpected event may trigger a rethink of the whole approach. But people keep thinking and keep trying. This generates a wealth of experience from which lessons can be drawn. The multi-country action-learning initiative described in this report was designed specifically to increase our understanding of the role of the market in promoting the provision of watershed services to improve livelihoods.

To recap, two main methodological approaches have been pursued. Firstly, research teams in six developing countries collaborated to shape the emergence of PWS mechanisms at selected sites, commissioning baseline studies, carrying out necessary research to help move things along as well as facilitating and negotiating potential PWS arrangements. Secondly, experience from some 50 PWS cases around the world was collated and analysed. This penultimate section of the report offers some overall lessons learned from our work.

An initial conclusion worth emphasis is that developing PWS is an extremely challenging and complex task. By implication there is still a lot to learn. We can also conclude up-front that, with a few exceptions, it appears that the direct livelihood impacts from PWS are as yet generally very limited. Furthermore, although PWS schemes have generally been developed primarily as a tool to deal with environmental challenges, there is little evidence of substantial success in this so far. Below, we look a little deeper into the picture this experience paints. In each of the following sub-sections, framed by a key question, we attempt a summary conclusion from the evidence, followed by one or more explanatory lessons.

4.1 Can payments for watershed services reduce poverty and improve livelihoods?

Conclusion 1

Payments for watershed services should not be considered as a tool for widespread use in reducing poverty in developing countries. While evidence from some schemes shows modest increases in household incomes from PWS, the effects cannot be considered as substantial reductions in poverty. Our evidence does, however, suggest that indirect effects of PWS development have substantial potential to reduce poverty – yet these effects are rarely specific to PWS and could potentially be generated through alternative actions.

There are better ways of reducing poverty than PWS: new PWS mechanisms were developed at two sites in Indonesia and one in India, while the initiative also supported and strengthened an emerging scheme in Bolivia (Munawir and Vermeulen, 2007; Agarwal *et al.*, 2008; Asquith and Vargas, 2007). In all cases the payments from buyers of watershed services to suppliers of watershed services were modest and may not continue beyond the short term (Table 3). This suggests that there may be better and more effective mechanisms for reducing poverty. For example, halting or changing policies that directly harm poor people, or that have harmed them in the past, can bring dramatic results. Since poverty and landlessness are often closely correlated, PWS schemes have limited potential for poverty reduction since benefits generally accrue to the landed and not the landless (Porras *et al.*, 2008). Experience from the Caribbean suggests that, where they can be developed, PWS mechanisms will only address the livelihoods of *de jure* and *de facto* landowners (McIntosh and Leotaud, 2007). In the Ga-Selati catchment, South Africa, landlessness and poverty are largely due to the apartheid land policies of the governments before 1994. It is only once these inequalities have been dealt with and other constraints addressed that people will have the opportunity to improve their livelihoods (King *et al.*, 2008). While in the Bolivia PWS sites some landless people have benefited through occasional employment to assist with processing honey (Asquith and Vargas, 2007), this is not a substantial effect.

Indirect effects of PWS can be significant – particularly in building social capital: the evidence from the PWS arrangements in Bolivia, India and Indonesia indicates that, while the direct impacts on livelihoods are marginal, the indirect benefits that are created are more significant. In Bolivia, this is in the form of increased trust and cooperation between upstream and downstream communities (Asquith and Vargas, 2007). In both the Brantas and Cidanau pilots in Indonesia, a proportion of the income received by the farmers' groups in the nascent PWS schemes has been invested in local business opportunities (e.g. goat breeding, fodder stores, nurseries). In these examples watershed payments are acting as sources of discretionary and untied financing that allows the beneficiaries to decide for themselves on the best

form of investment, considering local opportunities and risk (World Bank, 2002). As important, however, has been the apparent boost in self-determination that has allowed the farmers' groups, particularly in the Brantas sites, to enter into a new set of diverse external partnerships with government departments, universities and district forest offices (Munawir and Vermeulen, 2007).

Participants in the PWS-like agreement involving exchange of labour and planting material between two village development committees at the Kuhan site in India perceive the arrangement to have 'a higher moral value' compared to those that are contingent upon external funding. It is thought that its chances of sustainability are higher as a result. In an analysis of the experience to date, the critical role of local negotiation was highlighted as the reason why marginalised groups from both villages had been implicitly recognised and included in the arrangement (Agarwal *et al.*, 2008).

Astute development of PWS thus appears to build social capital – it can bring stakeholders together to work through key common issues and antagonisms that would otherwise not be resolved. Working through the complexity of issues typically involved in watershed relationships can itself be a major benefit. Such social capital can contribute to greater local empowerment – and a contract-based approach seems to improve the chances of significant empowerment, as parties to the contract take control of, and responsibility for, their own actions.

A key – and as yet unanswered – question is whether the indirect benefits of PWS are sufficient to justify the investment in PWS mechanisms. Such indirect benefits could perhaps be better developed more directly and cost-effectively through other means. Furthermore, evidence of the sustainability of PWS indirect effects on poverty is still scarce, as is the ability to assess what would have happened in each case without PWS interventions (Ferraro and Pattanayak, 2006). It is appropriate, however, to identify from the evidence those key actions that would be likely to improve the indirect poverty-reduction effects of PWS. There are two actions that stand out. The first is to secure the access of local people to watershed resources and the services upon which they depend. The second is to reinforce, rather than undermine, existing state, traditional, community and private management systems, although this can entail major trade-offs between them.

There is little evidence of PWS doing any harm to poor people: with the emergence of payments and markets for ecosystem services came the concern that they may actually have a negative impact on poor and landless people's livelihoods (Landell-Mills and Porras, 2002). However, in the project sites, there is very little evidence of any negative impacts. For example, at the Kuhan site in India, one family whose access to water for livestock was restricted by the

agreement between the two village development committees took it upon itself to remove the check-dam; however this is more that offset by the increase in the number of downstream water users (Agarwal *et al.*, 2008). The wider analysis of 50 PWS cases in developing countries finds little evidence of adverse impacts upon those participating. This holds for both the suppliers of watershed services and the 'buyers' – where consumers are being required to meet some or all of the costs through tariffs and fees (Porras *et al.*, 2008).

Publicly funded PWS schemes that are rolled out according to a blueprint plan are more likely to impact negatively on some participants since these schemes lack the capacity for local adaptation and negotiation. There is, for example, evidence of coercion of participants, undermining of local livelihoods, and rent-seeking by officials in the implementation of the SLCP in China (Li *et al.*, 2007; Bennett, 2008). Conversely, in Mexico's national programme, PSAH, 78 per cent of the payments have been made to people who are living in areas that are highly marginalised (Munôz-Pina *et al.*, 2008). But in practice there is still a bias against the 'poorest of the poor' even within these areas. Consequently, measures are being taken to ensure that the poorest are more effectively targeted by future PSAH payments (Muñoz-Pina *et al.*, 2008).

Effective targeting can make PWS programmes better at alleviating poverty: there is evidence that facilitators of PWS schemes are learning from their experiences and there are 'second generation' PWS schemes that are being set up with specific poverty reduction and livelihood objectives (Porras *et al.*, 2008). Examples include programmes such as RUPES in Asia and Cuencas Andinas in South America, in addition to Mexico's PSAH mentioned above. These programmes are considering wider contexts of land use, for instance by including potentially sustainable agriculture and agro-forestry options in the schemes, rather than just those linked directly to forests (Porras *et al.*, 2008). Their success will also depend on identifying and targeting the poorest cohort of residents within a catchment. This, in turn, will require innovation in payment mechanisms where the poorest have no land. In this respect, South Africa's Working for Water Programme is an educative example – it provides employment opportunities in areas of high unemployment, and its consistent funding by government (funding from poverty alleviation sources) is testament to the political success that it enjoys in South Africa (Turpie *et al.*, 2008).

4.2 What has been the impact of payments for watershed services on water and land management?

Conclusion 2

Environmental impacts causally attributable to PWS schemes appear to be limited. There is little evidence from the action-learning sites to suggest that payments for watershed services have had a significant effect on land management and water indicators – although the schemes are generally still in their infancy and at pilot scale. While some schemes around the world are promising in this regard, our review work generally confirms this picture of very limited environmental effects.

Complexity of relationships between land use and water is the norm: across the project countries and sites there was no common or single cause of land-use change or reduced water quality and quantity. Causal and quantified relationships between land use and indicators of water quality and/or quantity – the basis of a PWS mechanism – were, and are, complex and difficult to establish. In South Africa, robust estimates for the volume of water that could be 'saved' were provided for the Ga-Selati and Sabie-Sand catchments (Chapman, 2006 and 2007). These were possible because in South Africa there are strong time-series data sets on streamflow, substantial bodies of scientific work on water use by alien invasive species, and a broad pool of specialist hydrological expertise. These conditions are seldom evident in other developing countries (Calder, 2005).

The complexity of the land-use–water relationships is highlighted by examples from the Caribbean and India. Analysis of water quality data from the Buff Bay/Pencar catchment in St Lucia showed no difference as a result of investment in catchments management activities (Cox, 2004). At the scale of the Bhoj Wetlands in India, it proved to be very difficult, for both analytical and political reasons, to differentiate between rural and urban sources of pollution (Agarwal *et al.*, 2008). In China there is an all-pervasive view that tree planting is good for watersheds and that reforestation will reduce the substantial rates of soil erosion in the Yangtze and Yellow river basins (Bennett, 2008). However there is a very tenuous causal link between reforestation of sloping lands and the devastating floods that occur with regular frequency (and that were, indeed, the stimulus for the implementation of the Sloping Lands Conversion Programme in the first place) (Bennett, 2008).

Scientific evidence is often weak – but locally logical and fair action may still be feasible: the fact that changes in land use can affect water quantity (of streamflow and groundwater), water quality, and the evenness of flow is generally not contested. The debate and constraints to developing actions affecting watershed services are centred on the difficulties of pinpointing and sufficiently quantifying these relationships. While broad rules exist, precise relationships between land use

and water will be site-specific due to the unique interaction of topography, scale, climate, infrastructure and existing land-use systems (see Box 10). Nonetheless, a common understanding of the likely effects of land-use change upon hydrology is fundamental to the potential success of many payment mechanisms. Buyers of watershed services are unlikely to make payments unless they are confident that the agreed land-use change will bring about desired changes in water quality or quantity downstream.

However, public perceptions about the links between land use and water flows are sometimes at odds with scientific findings. So in addition to 'getting the science right', PWS initiatives need to be based on what local stakeholders perceive to be logical, fair and feasible. Trade-offs between public perception and scientific knowledge may thus occur. The experience from across the project's sites on the need for, and the precision of, hydrological relationships is varied. In Indonesia, the two pilot sites were developed without supporting hydrological evidence, largely because re-establishing tree-cover is widely regarded as the appropriate intervention due to the large-scale loss of forest cover (Munawir and Vermeulen, 2007). In the Caribbean, the hydrological analysis of the Buff Bay/Pencar watershed showed that there was no measurable impact of conservation activities initiated by a voluntary group. But it has also noted that there is very little ongoing hydrological research into the impact of reforestation programmes, and that most of it is based on the broad assumption that more trees will improve the watershed services in a broad sense (McIntosh and Leotaud, 2007). A hydrological study in Kuhan challenged local perceptions about the areas within the micro-catchment to be protected (Agarwal *et al.*, 2008). The results of the survey formed the basis for the agreement to rehabilitate 12 hectares of land that had been used as a grazing area.

While the evidence from the project sites is contradictory on just how much, and how precise, hydrological information needs to be to develop a PWS mechanism, an alternative approach is one of adaptive management. The challenge of managing complex systems (like watersheds) and/or the absence of precise causal relationships can be overcome by adopting an adaptive management approach (Holling, 1978; Westley, 2002). For adaptive management to be successful, however, some conditions have to be met. Firstly, there is a need for clear objectives – the more clearly the objectives are defined, the easier it is to identify the minimum amount of data needed from monitoring. Secondly, such monitoring and evaluation needs to be followed through to show whether the objectives are being achieved or whether adjustments are needed.

The scheme at Los Negros in Bolivia demonstrates the advantages of clear objectives that provide relatively straightforward monitoring approaches. Such monitoring raises transaction costs, but perhaps not as much as trying to

implement blueprint schemes that falter through lack of information and feedback. In some cases, monitoring costs can be reduced by use of proxy indicators. For example in the Bolivian case, downstream farmers are concerned primarily about the number of days in which there is no flow. It has thus been suggested that it may not actually be necessary to measure water quantity or even flow volumes. Flow is lowest in July, so it may be that documenting the number of days then when there is no flow, or even basing the assessment on perceptions of whether water is available for more days in July, may be an adequate basis for monitoring the PWS scheme. It is usually perceptions of change that are important, at least initially, as a stimulus for action. Detailed measurement can often come later, when the need for more precise data is more clearly defined.

Targeting critical areas within watersheds will increase the effectiveness of PWS mechanisms: the land within watersheds is not homogenous – within each watershed there are critical and less critical areas depending on the nature of the improvements that are sought. If the hydrology can be well understood, targeting these areas will increase the effectiveness of PWS mechanisms. In Kuhan, India, a process of consultation, mapping and rapid hydrological assessment identified the 12-hectare site that was the source of silt (Agarwal *et al.*, 2008). There is some evidence that 'second generation' PWS schemes – which are more focused on livelihoods – are paying more attention to hydrological understanding and targeting of critical areas (Porras *et al.*, 2008). Recent advances in remote sensing and modelling have substantially improved these prospects (Calder, 2005). Improved measurements and better hydrological models are also being used to dispel some of the myths around forests and land use. For example, it is now generally accepted that forest cover only influences rainfall at massive scales, e.g. at the level of the Congo or Amazon basins, while the role of cloud forest in intercepting rainfall and thereby contributing to streamflow is smaller than originally believed (Calder, 2005; Bruijnzeel, 2004).

Payments for watershed services have limited physical applicability: globally, the scale and extent of land-use change over the last 50 years has been enormous and, in some senses, relatively uncontested (Adams and Jeanrenaud, 2008). Over the next 50 years, the rate of land-use change may well increase with, for example, an extensification of cultivation due to climate change and expansions in land areas devoted to feed-stocks for bio-fuels. Large areas of sub-Saharan Africa are expected to become more arid with the likelihood of demographic changes, diverse land-based survival strategies, and extension of cultivation into ever more marginal areas. Under these conditions the competition for water, and the interactions between water and land use, are going to become even more important (Mayers *et al.*, 2009). The complexity of the causal relationships and the socio-economic conditions that need to be fulfilled in order to develop a PWS mechanism that

stands the test of time, suggest that the applicability of such mechanisms is limited to a quite small range of environments. For example, a biophysical and socio-economic review of Bolivia watersheds suggested that payment-like mechanisms for the management of dry-season water quality and quantity would only be worth pursuing in about ten out of over a hundred 'sub-watersheds' in the country (Asquith and Vargas, 2007).

4.3 What factors affect the supply of watershed services?

Conclusion 3

To change farmers' behaviour, payments for watershed services must be competitive with existing and perceived future net returns to land and labour. However, insufficient connections between suppliers and users of watershed services, coupled with social resistance to payment mechanisms in some contexts, are major barriers that intermediary organisations often find difficult to overcome.

Awareness of market opportunities is low – third parties can play key roles: individual farmers and upstream land managers generally have little sense of how their collective uses of land and water impact on users further downstream. This disconnection is exacerbated by greater physical distances between farmers and water users, such as the common distances between the uplands and urban areas. Furthermore, the supply of watershed services is often governed by non-linear relationships between variables and thresholds; these make it very difficult – even for expert hydrologists – to predict how and when a service might change. Thus it is not surprising that there is very little awareness within communities of upstream farmers that they may be able to participate in an economic transaction for the supply of watershed services. For a large majority of farmers in upland areas, issues of land use are more often than not associated with governments (either central or local) trying to achieve objectives through the imposition of restrictive legislation.

Evidence from the project's action-learning sites suggests that the opportunities for developing a relationship based on a payment are weakly perceived by both suppliers and users of watershed services. That potential buyers and suppliers of watershed services are typically brought together by intermediary organisations rather than through spontaneous interaction seems to confirm this. The global review of PWS cases illustrates how difficult it is to identify the key drivers of a local scheme, especially when its scale is small. Between 2002 and 2006, the available data indicate that there was an increase in the number of PWS initiatives that have been driven by the suppliers of watershed services. However, the authors attribute this largely to the willingness of donor agencies to consider PWS mechanisms for poverty alleviation. While some schemes may appear supply-driven, they are in essence facilitated and motivated by a third party.

Payments need to be big enough to create a real incentive for change: farmers in catchments are making individual land-use decisions on the basis of their perceptions of the net returns from different activities (Dobbs and Pretty, 2008). In an upstream landscape differentiated by slope, vegetation cover, soil type and land use, the key questions are often around the exact changes and the total cost of the changes required from farmers in order to effect land-use change and to release a payment. Under some circumstances, payments are unlikely to be sufficient to persuade farmers to radically alter their current land use, especially in developing countries (Wunder, 2005). Therefore, intensively cultivated land on Java, Indonesia, is unlikely to be wholly reforested. The project has shown, however, that farmers may use small payments to collectively replant areas that have been severely degraded through erosion on which the opportunity costs of change are low (Munawir and Vermeulen, 2007). Similarly, relatively modest payments may also limit the extensification of farmers into areas of natural vegetation cover (e.g. in Los Negros, Bolivia). The project's activities in the Caribbean show that payments in watershed schemes there are unlikely to be high enough, even where there is a demand, to get farmers to switch from traditional crops like coffee, or illegal crops like marijuana, because the current returns from these crops are so high (McIntosh and Leotaud, 2007).

Cultural factors can constrain the development of PWS: cultural factors of many forms can have direct and indirect effects on land use. The antipathy in many places to the whole concept of 'payments' is due to its apparent alignment with economic liberalisation and structural adjustment programmes that were led by the Bretton Woods institutions. The hostility towards notions of payments and markets has led to the use of a range of alternative terms such as 'rewards' and 'compensation' for watershed services (Wunder, 2005). But all terms transmit slightly different signals to stakeholders. 'Rewards' has overtones of paternalism (but also of entitlement, justice and equality) and runs the risk of raising excessive expectations. 'Compensation' meanwhile implies that only those who bear a cost should benefit. In India, the project team preferred to use the term incentive-based mechanisms, implying a broader form of PES (Agarwal *et al.*, 2008).

The diagnostic studies in Bolivia reveal a polarised view of water. Indigenous highland Bolivians view water as a 'universal and communal right (that) should be distributed equitably according to the needs, traditions and community norms that respect the water cycle" (Miranda, 2007, quoted in Asquith and Vargas, 2007). Elsewhere in the country, communities have developed longstanding mechanisms for exchanging water rights. The failed privatisation of the ailing Cochabamba municipal water supply company that led to nationwide protests against market-led water solutions also played an important role in the general hostility towards incentives associated with water.

4.4 How much demand is there for watershed services?

Conclusion 4

Demands on watersheds are growing, and increasingly competing with each other. In nearly every watershed, in nearly every country, water quality and quantity are deteriorating because of increasing demands and changes in land use. The concept of someone paying for ecosystem services is relatively new, and the existence of a compelling 'business case' for them to do so is relatively rare. While demand in Africa remains low, there is considerable proliferation of schemes in Latin America and Asia.

Private sector demand for watershed services is still low: willingness to pay for watershed services is a prerequisite for demand and therefore a necessary, but not sufficient, condition for the development of PWS (Landell-Mills and Porras, 2002; Wunder, 2005; Pagiola *et al.*, 2005). Out of ten 'best-bet' sites, our project was able to develop pilot PWS mechanisms in three and support an existing mechanism in a fourth. However, in these project countries in general, there is little evidence of widespread demand for PWS schemes as a solution to the twin challenges of land management and the provision of water.

In South Africa, despite what appeared to be a very favourable set of conditions for the development of PWS mechanisms, there was clearly very little appetite for PWS solutions within the selected catchments. One explanation for the low demand is that policy reform around land and water has generated considerable uncertainty amongst potential buyers. Consequently, addressing long-term water issues was not a pressing issue for the commercial farmers in the Ga-Selati catchment (King *et al.*, 2008). The situation was further complicated by perverse water pricing, which meant that at least one potential buyer could achieve the same objective with substantially lower risks by buying water through inter-basin transfers (Wise and Musango, 2006). This highlights not only the perversity of water-pricing, despite the extensive water reform process, but also the preponderance of supply-side engineering solutions to water management in South Africa (King *et al.*, 2008).

The development of PWS mechanisms in the Caribbean at the Buff Bay and Pencar sites was constrained by the unwillingness of water users to pay for watershed services. As in South Africa, water pricing was an issue. In Saint Lucia and Jamaica, water is essentially subsidised and there is substantial consumer resistance to any increases in the cost of water. Under these circumstances it is very difficult to envisage how payments for watershed services could be developed. Still, within the Caribbean there was a sense that the tourism sector would be more willing to pay for land management practices that ensured clean water and avoided the silting up of reefs. But within the tourism sector there is a sense that taxation is already

heavy and that it is government's job to ensure appropriate land management that protects the integrity of the coastline upon which the tourism sector is based (McIntosh and Leotaud, 2007). In some situations the private sector may already be making regulatory payments – e.g. payments for catchment area treatment made by larger hydro-electric projects in India. Here the focus needs to be on complementing business-as-usual tree-planting and engineering activities to completing the PES cycle and recognising upstream communities as service providers.

Notwithstanding the very limited demand for PWS within the project countries, there has been a global growth in PWS as a tool. Porras *et al.* (2008), note that there has been a 'remarkable growth in the number of PWS schemes and proposals, particularly in Latin America and Asia' – but many fewer, and hardly any private sector-led, in Africa.

Publicly funded schemes can constrain or stimulate privately funded schemes: in China, for example, interest in market-based PWS schemes has soared amongst the educated and political elites in recent years. The huge investment in a diverse set of incentive-driven land management programmes is tangible evidence of the importance that government has attached to incentive-driven changes in land management. At a national level, payments for watershed services are clearly enunciated in the *11th Five Year Development Plan* (National Development and Reform Commission, 2006). Yet the overriding dominance of the large government programmes has meant that local innovation and the opportunities for privately or user-funded PWS schemes has been limited (Li *et al.*, 2007). Similarly, in South Africa some have noted that the government-funded Working for Water programme, while providing important employment opportunities and having significant ecological benefits, has also effectively constrained the development of privately funded processes (King *et al.*, 2008).

Conversely, in Costa Rica, the government's programme (PSAH) has provided the leadership for similar initiatives by the private sector (Porras *et al.*, 2008). It is estimated that there are now about 14 privately or user-funded schemes in Costa Rica (Porras *et al.*, 2008). And while Working for Water predominates in South Africa, some commentators note possible catalytic links between it and individual user-funded PWS schemes that are now starting to emerge (Turpie *et al.*, 2008).

4.5 What kinds of payments are being made in emerging PWS schemes?

Conclusion 5

There is considerable diversity in the method and frequency of payments in emerging PWS schemes – from cash to in-kind payments, and from one-off to regular payments. Intermediaries and administrators play key roles in determining the price. Asymmetries in power, resources and information between stakeholders suggest that efficient price determination mechanisms are unlikely to develop in the near future.

Diverse payments and payment mechanisms are a response to local conditions: the type of payments, the mechanisms by which they are made and their frequency, varied considerably even within the small sample of action-learning sites. Cash payments were made to farmers' groups at the Indonesian sites in Brantas and Cidanau catchments, while payments between buyers and sellers in Los Negros (Bolivia) and Kuhan (India) were not cash payments. In three of the four cases payments were made using intermediaries. Only in Kuhan did the transaction take place directly between buyers and sellers. The frequency of these payments also varied between the sites: in Bolivia annual payments have been made; in Kuhan there has been a one-off payment; and in the Indonesian cases payments have been made over fixed areas for fixed periods, with options for renewal. This diversity is typical of the user-funded PWS mechanisms that are small, flexible and can respond to local conditions. The international review of local schemes shows that most schemes fall into one of two categories. Where cash payments are made, these are generally paid on an annual basis while in-kind payments tended to be one-off.

In contrast, large publicly funded PWS schemes tend to use simple, generally financial payment mechanisms that tend to be based on flat rates with little spatial differentiation (Porras *et al.*, 2008). However the national PWS scheme in Costa Rica differentiates between land uses, with different rates being paid for forest conservation, reforestation, and agro-forestry. Similarly in Mexico there are different rates of payment for cloud forest and other forest types (Munôz-Pina *et al.*, 2008).

Differentiated payments within a scheme can be effective practically: amongst PWS mechanisms, our limited data point to a high level of payment diversity within schemes. In other related disciplines (such as community-based natural resource management) there has been considerable debate over the equality and allocation of natural resource-based revenues within communities and the potential dangers of 'elite capture' (see Child *et al.*, 2004; Fabricius, 2004; Hulme and Murphree, 2001). The limited evidence from this project suggests that payments need not necessarily be equal as long as they are perceived to be fair. Simple measures of area or distance from a river or stream, modified perhaps by slope, may prove

to be sufficient proxies to design credible but differentiated PWS schemes. For example, in Los Negros farmers accepted differentiated payments both by area and by the type of forest that they are conserving (Asquith *et al.*, 2008). Those in the cloud forest zone received US$ 3 ha^{-1} compared with US$2.25 ha^{-1} in the moist forest, because it is perceived that the protection of cloud forest provides greater watershed services than the moist forest and other vegetation types (Asquith *et al.*, 2008). That farmers living outside the cloud forest zone accepted this without complaint suggests both an appreciation of the value of cloud forests, and an appreciation of the importance of the conditionality in a contract-based system. Such differentiated payments may not work so well in other environments where the impacts of different land uses are less clearly perceived.

Prices are yet to be determined by 'the market' – administrators and intermediaries dominate: theory tells us that market-based transactions between willing buyers and willing sellers of watershed services will lead to cost-effective outcomes and the efficient use of resources (Wunder, 2005; Engel *et al.*, 2008; Claassen *et al.*, 2008). Our sample, although small, suggests that in reality price determination is a lot messier than in theory. The small intra-village example of Kuhan in India is the only example of where there were not substantial asymmetries of power and influence between relatively powerful buyers and relatively weak sellers. Here, in-kind payments have been negotiated and modified over a considerable period.

In the global review's sample of 38 locally or user-defined schemes, prices were administratively determined in 18 cases while in 17 cases there was some negotiation between buyers and sellers, albeit conducted through an intermediary. In just three cases was there direct negotiation between the buyers and the sellers. In contrast, publicly funded schemes are, as one would expect, characterised by administrative (non-negotiable) pricing. In practice, the review showed that it is not unusual for there to be a combination of price discovery mechanisms. For example, in the national scheme in Costa Rica, although payment levels to providers are set for the national programmes, payments made by water users are determined through negotiations with the government agency administering the scheme, while local facilitators help bridge the gap to local farmers and water users (Porras *et al.*, 2008).

The evidence to date suggests that, at present, price discovery processes between buyers and sellers of watershed services are yet to reach such maturity – with current arrangements characterised by simple and often administratively determined prices. The asymmetries in terms of power, resources and information that exist between the stakeholders in these examples suggest that cost-effective and efficient price discovery mechanisms have not yet been developed (Ferraro, 2008).

Transition payments may be more realistic than in-perpetuity payments: again, in theory, payments for ecosystem services are predicated on the basis that there are strong externalities and that costs and benefits are not location-specific (Engel *et al.*, 2008). This implies that payments need to be regular and sustained to ensure that sellers do not revert to previous, less desirable (to the buyer) land-use practices. But some changes may only require a one-off payment, or period of payments, before they can be sustained. Our review of watershed payments in developing countries showed that government schemes tend to make regular annual payments, while the local- or user-funded initiatives are split between regular payments and one-off, and/or in-kind payments. The evidence from the project sites is too sparse to be able to conclude on the efficacy of different payments methods. However, developing tools to assess the efficacy of different payment models will be an important line of inquiry in the future – especially with the growing interest in PES-based options for addressing greenhouse gas emissions and climate change.

A wide variety of other incentives for watershed management are in play that may one day lead to PWS: in many of the countries explored through the project there are a range of incentives for watershed management. Typically these do not specifically construct a payments relationship as envisaged by the PWS models, but take the form of indirect benefits from the state. These benefits include, for instance, free provision of tree seedlings to land managers, tax credits for tree planting or water conservation activities, and grants to community-based organisations. While these activities are seldom recognised as prototype PWS mechanisms, they do represent incentives to land managers and may have conservation and livelihood benefits that in the long term offer a basis upon which to build more direct relationships. The potential constraints – both to their own sustainability and to their efficacy as routes to PWS – would appear to be that most are government-led, administratively priced, and display little if any contingency – some even involve farmers participating involuntarily.

4.6 What role does government play in the development of payments for watershed services?

Conclusion 6

Some governments (like those in China, Costa Rica, Mexico and South Africa) have become buyers of watershed services; all governments, through policy and legal frameworks, are critical for shaping how PWS schemes develop. Land and resource tenure is particularly important – but much policy and law is contradictory or ineffective. PWS protagonists may be able to help governments consider the appropriate balance between efficiency and equity in policy and law.

Government legal and policy frameworks shape what is possible in PWS schemes: payments for watershed services do not take place in a political or legal vacuum. The roles and degrees of influence of government depend on the nature and scope of government on the one hand, and on the scale of the payments for watershed services scheme on the other. The direct influence of government on small, local schemes may be minimal, especially if government itself has already devolved authority for watershed and natural resource management to local levels (e.g. the weak devolution in Himachal Pradesh, India), or if its influence just does not extend that far (e.g. Los Negros, Bolivia). In contrast, very large schemes may be wholly dominated by government policy and practice, since no other organisation has the necessary reach or mandate to encompass and integrate multiple jurisdictions (e.g. China, and to a lesser extent South Africa).

In intermediate-sized schemes there appears to be a higher likelihood of government policies meeting local aspirations. Where these two differ, the need for compromise arises. This is clearly seen in the case of Indonesia, where government agencies (national in the case of the Brantas watershed, provincial in the case of the Cidanau catchment) are working with local people, the private sector and NGOs to take on board and reconcile differing perceptions, concerns and interests.

The legislative framework that governs issues of tenure, security, and the drafting and enforcement of contracts is also crucial to ensuring fair deals – or to obstructing them, depending on how the legislation is formulated and applied. Defining and upholding tenure rights (both ownership and use rights) is important not only in PWS schemes but in other contexts as well. In Indonesia, the emergence of PWS schemes has helped to consolidate government support to entrench user rights, though ownership rights still remain unclear and unresolved. Where there are divergent policies (e.g. China, where the agricultural and forestry policies are contradictory), governments can work to reconcile these (Sun and Chen, 2006b). Legislation that is conducive to the formation of politically credible committees, groupings or agencies that have the power to enable user-provider engagement, is also critical (e.g. Indonesia and South Africa).

Government-financed PWS schemes have advantages and drawbacks: government PWS schemes tend to be large in scale, ignoring much variation amongst people and places, and instituting PWS as a blueprint rather than as a set of interim arrangements to be shaped by local circumstances. Such schemes may be less efficient (because of more layers of bureaucracy, also because they cannot demand the levels of contingency that PWS implies); they can lead to rent-seeking behaviour (because of weak checks and balances in that bureaucracy); and they may be incapable of meeting the needs of the very poor. However, good examples can be found: the Working for Water programme in South Africa has achieved some notable successes and in China some local governments are exploring the creation of incentives through negotiated and differentiated payments with local groupings under the Ecological Forest Compensation Fund.

Government policy is frequently fragmented and often perverse: typically government policy towards water and land management is fragmented and often characterised by contradictory approaches leading to perverse outcomes. In the Caribbean, the plethora of laws and regulations pertaining to land use and water management contribute to the high levels of landscape degradation and soil erosion (McIntosh and Leotaud, 2007). The situation is exacerbated by policy contradictions such as subsidies to agricultural inputs that promote the extensification of cultivation in inappropriate places (McIntosh and Leotaud, 2007).

Policy contradictions are very evident in China where, on the one hand, government is a major buyer of environmental services through the Sloping Lands Conversion Programme and other programmes, and on the other hand food self-sufficiency is a major government policy (Li *et al.*, 2007). These two policies are in direct conflict with each other, one result being highly compromised efforts to reduce cultivation on steep slopes in areas of low agricultural potential and erosion-prone soils (Sun and Chen, 2006a). The development of payment mechanisms can also be limited by overlapping and multiple administrative jurisdictions. This is particularly evident in the Bhoj Wetlands in India, where there are multiple administrative bodies operating at different geographical scales; these include rural village-level panchayats[32] and district governments, as well as the Bhopal Municipal Council (Agarwal *et al.*, 2008).

Government's role in defining and upholding land ownership is particularly critical: secure land tenure is frequently cited as a necessary condition for many environment and development activities, including developing watershed services.

32. The **Panchayat** is a South Asian political system mainly in India, Pakistan and Nepal. 'Panchayat' means assembly (*yat*) of five (*panch*) wise and respected elders chosen and accepted by the village community (http://en.wikipedia.org/wiki/Village_panchayats).

Without tenure, owners of land cannot be identified whereas weak tenure limits investment in land management and conservation. From our action-learning sites the most striking impact of land insecurity was not on the supply-side but amongst the potential buyers of watershed services in the Ga-Selati catchment in South Africa. Here, post-apartheid land reform meant that farmers had other pressing concerns over and above developing long-term measures to ensure additional water (King *et al.*, 2008).

In Bolivia, formal rights to land are extremely rare but Fundación Natura successfully developed the Los Negros scheme by recognising de facto rights (Asquith and Vargas, 2007). Similarly in Indonesia, the PWS pilots were developed in areas with few formal land rights. There is a sense, however, that the PWS mechanisms contributed to a process that consolidated user rights, though ownership rights still remain unclear and unresolved (Munawir and Vermeulen, 2007). In India, unclear local control over government forest land in the catchment of Kuhan was one reason why farmers preferred to focus on controlling grazing on private lands as the more feasible option (Agarwal *et al.*, 2008). Evidence from the PWS review suggests that in most payments schemes, both at a national and at a user-funded level, payments are being made to private landholders – the implication being that PWS schemes are not generally being developed in situations of communal or unclear tenure.

Balancing regulation and incentives, equity and efficiency, is easier said than done: incentive-led approaches to land and water management are considered by some to have greater potential for efficient and effective outcomes than regulatory approaches (Landell-Mills and Porras, 2002; Pagiola, 2005). Regulation, and in particular the declaration of protected areas, has been a very effective means, until relatively recently, of protecting watersheds and upper catchments. The problem is that large-scale land-use changes outside of protected areas have left them isolated and often unable to fulfil their original objectives. In the Caribbean, the challenges and the costs associated with developing PWS mechanisms strongly suggest that they are not an effective substitute for land-use planning and associated regulation (McIntosh and Leotaud, 2007). Overall, however, the project has not been able to shed much light on the appropriate mix and relationship between incentives and regulatory approaches to land and water management.

4.7 How can trust and transaction costs be optimised to make PWS work?

Conclusion 7

Trust and transaction costs are the 'make or break' for PWS schemes. Existing local institutions are likely to be crucial, but are rarely a panacea for PWS. Developing, implementing and monitoring PWS mechanisms can lead to high transaction costs that undermine viability or compromise efficiency. Whatever institutional path is chosen, the key to manageable transaction costs is likely to lie in trust amongst stakeholders.

Using existing institutions can reduce transaction costs: transaction costs can be defined 'as all those costs associated with buying and selling in a market' (Bannock *et al.*, 1991). In the context of PWS these include: agreeing on the nature, extent and timing of the payments or in-kind transfers; and drawing up contracts and monitoring the outcomes of the agreement on all parties. The level of transaction costs can 'make or break the market' (Landell-Mills and Porras, 2002). However, the simple theoretical models for PWS do not do justice to the real-life complexity of most catchments, where the actions of multiple stakeholders will either affect land or water use. There is growing evidence that transaction costs within PWS mechanisms might be higher than expected (Engel and Palmer, 2008).

It might be expected that the transaction costs of setting up a PWS scheme should match the expected benefits from the scheme. The larger the scale of scheme, and the more heterogeneous and complex its elements, the higher the transaction costs will generally be. There is scant evidence from the action-learning process on transaction costs. Costs of US$23,000 over three years were estimated for the interventions in Los Negros, Bolivia, by Fundación Natura (Asquith and Vargas, 2007). In other sites such figures are difficult to ascertain, but it can be noted that the grants to action-learning partners substantially exceed the level of payments facilitated in Bolivia, India and Indonesia. However, partners' costs also included a diverse set of learning and dissemination activities that are not directly associated with the transactions.

The project's experience from India and Indonesia shows that working through existing organisations, especially those on the supply side, is one way of reducing direct transaction costs. At both the Brantas and Cidanau sites, LP3ES and the local facilitating partners used existing farmers' groups. Similarly, at Kuhan in India, the existing political and traditional organisations (such as the village development committee) were used to negotiate and implement the payment mechanism. In South Africa, the evidence suggests that the absence of existing partnerships and organisations contributed to the limited outcomes (King *et al.*, 2008).

Neutral intermediaries fulfil multiple roles: buyers and sellers of watershed services are generally brought together through an intermediary or broker. These can be government departments but are more usually from the NGO sector. If the costs of the intermediary are not kept to a minimum, they may greatly reduce the amount that is eventually paid to the sellers, or render the whole scheme reliant on external subsidy. This clearly begs questions of the sustainability of the arrangements. The structure and role of the intermediaries is therefore of great interest to PWS protagonists. The evidence from the case studies points to a major role for civil society in facilitating PWS relationships – with a wide diversity of organisations involved, such as users organisations, NGOs, trusts and academic institutions. Within the portfolio of action-learning sites it is clear that in the Brantas, Cidanau and Kuhan sites the existing community organisations, and their relationships with the facilitators or intermediaries, were critically important in developing the nascent PWS mechanisms.

Installing adaptive management lowers risk but has high initial transaction costs: some approaches to bringing down transaction costs may increase risks. Agreements and contracts are focused on balancing risks amongst the parties. But arriving at credible agreements through adaptive processes can be transaction-heavy. Getting the principle of adaptive management accepted in the first place usually requires negotiation, especially with government representatives, both nationally and locally, as they tend to favour blueprint approaches (e.g. in China and India).

Trust between stakeholders reduces transaction costs – but it is hard to build and easy to lose: in Kuhan, India, facilitators used a simple hydrological assessment and a series of public meetings and activities[33] to build a common understanding and trust between two neighbouring communities (Agarwal *et al.*, 2008). Trust between parties helps in clarifying objectives and developing a common vision and sense of purpose. This is likely to be a scale issue, with trust between individuals and groups being possible in small-scale schemes, while trust in the process or mechanism may be more critical in large-scale schemes (see Appleton, 2002).

Trust can also be built through participatory research. For example in Bolivia, farmers have begun to collect hydrological data and, because they are 'theirs', their validity is looking more likely to be accepted. Transaction costs can also be lowered if there is fairly rapid convergence on points of agreement. In the Caribbean, economic valuation studies and other scientific data helped to raise awareness about the need for intervention and triggered the search for creative solutions (although these

33. Kuhan also organised 'eco-walks' for children, who then presented their findings (and enthusiasm) to adults (Agarwal *et al.*, 2008)

are not necessarily PWS mechanisms). In South Africa, the use of numerical data has been critical because important stakeholders in government and the business community are used to making decisions based on quantified information.

The diagnostic studies from Bolivia also highlighted another facet of participation: The most recent catchment and water management programmes in Bolivia have been top–down and donor-led, with little relevance especially for the poorer residents of the target catchments (Asquith and Vargas, 2007). Typically these programmes and projects have failed. However, their legacy is that a new generation of locally and NGO-led programmes are finding it extremely difficult to build confidence and secure participation, especially of poorer stakeholders (Asquith and Vargas, 2007).

Photo: Nigel Asquith

Bee boxes: in-kind payments for watershed services in Los Negros, Bolivia

5 Looking ahead

With nearly a decade of investigation and research by IIED and its partners into the links between ecosystems services, incentives and livelihoods behind us, it should be possible to look ahead, to make some predictions about what the future might hold and to suggest what can be done to try and shape it. Here we attempt this:

5.1 Keep the experiments coming, keep learning from them, and keep adapting

In Section 4 we emphasised that market-based mechanisms for watershed services are difficult to set up, and that they should not be seen as a blueprint for conservation or poverty reduction. Yet despite these conclusions, we also think that there is strong justification for further exploration and development of payments for watershed services. We think that the indirect benefits of PWS schemes can be considerable. The evidence suggests that the relationships between stakeholders who explore such schemes, particularly those developed within a framework of contracts and contingent payments, build social capital – enabling these stakeholders to work through issues and resolve antagonisms in ways not available to some other more conventional interventions for water and land management.

Payments for ecosystem services are likely to be most relevant where there are substantial externalities, i.e. a substantial proportion of the benefits and the costs of the current management regime accrue not to the land managers themselves, but to other stakeholders. Yet because of the complex relationships within a wide range of such stakeholders, there are few generic facts and time-tested solutions. Watershed processes are often site-specific and dominated by complex, random and often extreme events. Multiple causes and effects will always be very difficult to link together with certainty – even with much better information than we currently have – so outcomes of management actions are likewise hard to predict.

Adaptive management of PWS approaches is therefore needed – maintaining a flexible approach to implementation, and ensuring that research on PWS recognises the work that has already been done and the lessons that can be learned. Lessons from both positive and negative outcomes can be invaluable and interventions adjusted accordingly. Such adaptive approaches are best built on site-specific approaches to assessment that identify ecosystem functions that support provision of locally valued ecosystem services.

5.2 Expect and prepare for negotiation, and a blend of incentive and regulation

Buyers, sellers and intermediaries in PWS schemes are rarely uniform in their opinions and powers. There are no value-neutral positions on PWS and there is no source of absolute evidence that surpasses all others. This, of course, is the case in any field where uncertainty and complexity prevail – but it is worth underlining in the emerging field of PWS since it strongly implies that actors need to work together, to treat each others' views as legitimate, to expect change, to experiment and, above all, to keep questioning experience.

PWS is a tool that will fail, or become irrelevant, if it is not integrated with wider regulatory approaches, broader watershed management efforts, and explicit attention to governance influences that shape what is possible. Policymakers need to consider the opportunities to ensure that future policy and legislation allow for a mix of both incentives and regulations to ensure the effective management of land and water resources.

It may be possible in some developing country contexts for PWS schemes to grow without strong enabling regulatory frameworks and institutional cooperation, but only if such schemes are small and specific. At larger scales PWS schemes can only effectively serve as components of diverse (and at best integrated) watershed strategies. It is only at small-scale initiatives that cause and effect can be reasonably well understood and stakeholders can become directly engaged. Work at this scale provides the prospect of developing the capacity and tools to respond to larger-scale problems in a way that is representative of, and accountable to, livelihood interests. Although the values placed on improvement of water quality are modest at this scale, the prospects and the need to integrate the right land-use interventions into community resource management strategies are compelling.

5.3 Ensure that capacity is built and returns to livelihoods improve

Negotiated and adaptive approaches will only be achieved if capability is steadily built as part of a long-term process of building appropriate institutions that can help ensure fair deals for watershed services. This is true from the local to the national scale. From our action-learning sites and country experiences it is clear that critical expertise is very thinly spread and in some cases absent. Initiatives to make relevant expertise more accessible to those engaged with watershed issues and interested in PWS schemes, and to develop credible rapid assessment methods and other negotiation support tools, are sorely needed.

There are compelling reasons to improve the linkages between PES – and PWS in particular – and improved livelihoods. Firstly, there is the pressing need for diverse efforts to contribute to poverty reduction. Secondly, there are strong, albeit often complex, links between the environment and livelihoods – improved livelihoods can mean better environmental management. Thirdly, greater livelihood impacts are more likely to present greater incentives for behavioural change, thereby improving the efficacy of the instrument and its capacity to provide benefits. Strategies to improve livelihood impacts in PWS schemes include: better targeting of the poorest households; reducing the barriers to entry into these schemes; and creative means for involving landless, often the poorest, households.

5.4 Take the lessons from watersheds into the climate change arena

Conservation of forest, woodlands and land is currently high on many peoples' agenda due to the recognition of the links between deforestation and greenhouse gas production. It is estimated that approximately 17 per cent of all global greenhouse gas emissions are caused by land-use change and, in particular, the destruction of tropical forests (Rogner *et al.,* 2007, IPCC, 2007b). And reducing land-use change and forest degradation has been shown as a theoretically cost-effective way of slowing carbon emissions compared to other mitigation strategies such as curbing emissions from power stations.

Decisions taken at the recent Conferences of the Parties to the UN Framework Convention on Climate Change suggest that payments for reduced emissions from deforestation and degradation (REDD) in developing countries may become part of the post-2012 international climate change response regime. Consequently, the governments of many industrialised countries are announcing significant new funds to explore the means to tackle climate change in this way (see Bond *et al.*, 2009).

In essence, REDD payments will be global-level payments for ecosystem services. These payments are likely to take place at two levels: at the international to national level, between the international financing institutions (compliance market, voluntary market, and overseas development aid) and national level organisations; and at the national to sub-national level, between national institutions and sub-national levels such as land users, communities, and local governments (Angelsen and Wertz-Kanounnikoff, 2008). With this likelihood, further exploration of payments for watershed services in conjunction with REDD payments will be important since such 'bundled' payments for ecosystem services hold considerable promise.

Much like PWS, payments for REDD are conceptually simple, but there are multiple hurdles between conceptual appeal and effective implementation (see Angelsen and Wertz-Kanounnikoff, 2008). Key lessons here from the action-learning sites and international review are in the realm of governance. In particular, the application of contingency is likely to be highly contentious. Although the science underpinning REDD is better understood and less site-specific, massive challenges such as monitoring, reporting, and verifying emission reductions – especially at large scales – remain unresolved.

Photo: Ina Porras

Local experience with watersheds may tell us much about how we can respond to climate change

The emergence of climate change as the predominant global conservation and development issue, and the spotlight on deforestation and degradation, present both opportunities and threats that cannot be ignored. Correctly and sensitively implemented, payments for REDD can represent a long-term stream of finance to address human development and ecosystem issues in developing countries that vastly exceeds any previous financial transfers made through development assistance channels (Eliasch, 2008). However, in many parts of the world that will become more arid and climate-stressed, REDD and related interventions will need to recognise, and be assessed for, their implications for all other ecosystem services, particularly water. The overt focus on carbon sequestration and the mitigation of climate change could easily lead to interventions and policies that ignore the multiple services and complexity of ecosystems and landscapes. Getting REDD wrong could be bad news for conservation and livelihoods; getting it right could greatly brighten the prospects for fair deals for watershed services.

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Appendix 1: Project country partners and site-level partners

Country	Country partner	Site-level partners
Bolivia	Fundación Natura Bolivia, Av. Irala 421, 2do piso, Santa Cruz, Bolivia http://www.naturabolivia.org **Contact:** Maria Teresa Vargas	Municipality of Pampagrande and the Environment Committees of the communities of Los Negros, Santa Rosa and Palmasola
Caribbean	Caribbean Institute of Natural Resources (CANARI) Fernandes Industrial Centre Administration Building Eastern Main Road, Laventille Road, Trinidad http://www.canari.org/ **Contact:** Sarah McIntosh	Jamaica Forestry Department Saint Lucia Forestry Department
China	College of Humanities and Development (COHD) of the China Agricultural University No. 2. Yuanmingyuan Xilu Haidain Beijing 1 00094 China **Contact:** Jin Leshan	World Agro-Forestry Center (ICRAF) Chinese Academy of Agricultural Sciences (CAAS)
India	Winrock International India (WII) 788 Udyog Vihar, Phase V Gurgaon 122001 India http://www.winrockindia.org/act_proj_nat_devel_market_7.htm **Contact:** Chetan Agarwal	Himachal Pradesh Eco-Development Society (HPEDS): • Kuhan micro-catchment, Changar area, Kangra District, Himachal Pradesh • Bhodi-Suan micro-catchment, Changar area, Kangra District, Himachal Pradesh Lake Conservation Authority, Bhopal: • Bhoj Wetlands, Bhopal, Madhya Pradesh

Indonesia	Institute for Social and Economic Research, Education & Information (LP3ES), Jalan S. Parman 81, Slipi Jakarta 11420, Indonesia http://www.lp3es.or.id/ **Contact:** Munawir	Yayasan Pengembangan Pedesaan (YPP) • Brantas, East Java, Rekonvasi Bhumi • Cidanau, Banten, Konsepsi • Segara watershed, Lombok Island
South Africa	Council of Scientific and Industrial Research (CSIR) Environmentek P.O. Box 395 Pretoria 0001, South Africa http://www.csir.co.za/nre/environmental_assessment_and_management/ere.html **Contact:** Nicola King	Clean Streams Environmental Consultants • Ga-Selati catchment, Limpopo Province Nepid Consultants • Sabie-Sand catchment, Mpumalanga Province
International project co-ordinators	International Institute for Environment and Development (IIED) 3 Endsleigh Street, London WC1H 0DD UK http://www.iied.org/natural-resources/key-issues/water/developing-markets-for-watershed-services **Contact:** Ivan Bond	
All that glitters: A review of payments for watershed services in developing countries.	International Institute for Environment and Development (IIED) 3 Endsleigh Street London WC1H 0DD UK http://www.watershedmarkets.org **Contact:** Ina Porras	

Appendix 2: Action-learning site profiles

Bolivia: Los Negros	
Biophysical description	
Catchment name	Rio Los Negros
Area	250 km^2
Administration	Santa Cruz department
Upstream (sellers) profile	
Land owners and managers	Communities of Santa Rosa, Palmasola and Sivingal
Land-use systems	Forestry; agriculture; settlement
Land-use issue	Conversion of cloud forest to settlement and agriculture
Livelihoods	Small-scale agro-pastoral production systems
Downstream (buyers) profile	
Water uses	Domestic; agriculture
Water users	Residents of Los Negros; farmers in Los Negros Valley
Abstraction	Water for domestic use abstracted from river Water for irrigation abstracted above town and diverted into eight canals
Payments for watershed services (PWS)	
Core problem	Changing land use reducing water quantity for horticultural producers Further competition between urban domestic users and irrigators
Water service	Water quantity
PWS mechanism	Payments in-kind to farmers in catchment Year one – beehives (one per 10 ha of forest conserved per year) Year two – barbed wire – in return for maintaining forest cover
Sellers of service	In 2006: 34 landowners
Actual/potential buyers	Commercial horticultural producers in Los Negros town
Direct impact	Effectively, US$3/ha/year
Indirect benefits	Improved trust between upstream and downstream communities Higher levels of farmer confidence
Status of PWS mechanism	Ongoing
Reference	Asquith, N. and M. Vargas (2007) *Fair Deals for Watershed Services in Bolivia*, Natural Resources Issues No. 7. IIED, London.

India: Bhoj Wetlands	
Biophysical description	
Catchment name	Kolans River and the Bhoj Wetlands
Area	361 km^2
Administration	Madhya Pradesh state
Upstream (sellers) profile	
Land owners and managers	Privately owned farms and residences Limited common land Government-managed forest areas
Land-use systems	Agriculture 76% Urban 4% Plantations 6% Wastelands 7% Forest <1% Water bodies 7%
Land-use issue	Runoff from chemical fertiliser and pesticide use in agriculture in the rural catchment of the Bhoj Wetlands reaches the lake. This leads to eutrophication and reduced drinking water quality Erosion contributes to sedimentation of the lake, reducing future storage capacity
Livelihoods	Based around cultivation and livestock production. Locally, labour for agriculture important Casual and regular labour in the city of Bhopal
Downstream (buyers) profile	
Water uses	Domestic Light and heavy industry Recreational use of the lakes
Water users	Residents Light industry Heavy industry or bulk buyers
Distribution	Abstraction and distribution by Bhopal Municipal Corporation
Payments for watershed services (PWS)	
Core problem	High levels of agro-chemicals in Bhoj Wetlands and lake
Water service	Water quality
PWS mechanism	Proposed: transition to wetland-friendly/organic farming practices through the use of compost and bio-pesticides
Sellers of service	Not relevant
Actual/potential buyers	Bhopal Municipal Corporation, corporate bodies, public
Direct impact	Not relevant
Indirect benefits	Not relevant
Status of PWS mechanism	No mechanism implemented
Reference	Agarwal, C., S. Tiwari, M. Borgoyary, A. Acharya and E. Morrison (2007) *Fair Deals for Watershed Services in India*, Natural Resources Issues No. 10. IIED, London.

India: Bhodi-Suan	
Biophysical description	
Catchment name	The Suan Khad in the Bhodi-Suan catchment
Area	7 km^2
Administration	Himachal Pradesh state
Upstream (sellers) profile	
Land owners and managers	Privately-owned farms with some common grazing land. Small area of government managed forest land
Land-use systems	Cultivated 32% Private haylands 25% Grazing lands 27% Forest 8% River 5% Wasteland 3%
Land-use issue	Cultivation and over-grazing leading to erosion. Upper village suffers from wildfires
Livelihoods	Small-scale agro-pastoral systems
Downstream (buyers) profile	
Water uses	Domestic; irrigation
Water users	Households; farmers
Distribution	Water is abstracted directly from the Suan Khad
Payments for watershed services (PWS)	
Core problem	Soil erosion and siltation of proposed dam and low dry season flows
Water service	Water quality and quantity
PWS mechanism	Proposed: inter-village agreement to close grazing areas in upstream Bhodi village to reduce erosion and siltation problems in downstream Suan village
Sellers of service	Not relevant
Actual/potential buyers	Residents of downstream village
Direct impact	Not relevant
Indirect benefits	Not relevant
Status of PWS mechanism	Not implemented
Other	Main reason for no PWS being developed was the divergent views on the hydrology
Reference	Agarwal, C., S. Tiwari, M. Borgoyary, A. Acharya and E. Morrison (2007) *Fair Deals for Watershed Services in India*, Natural Resources Issues No. 10. IIED, London.

India: Kuhan	
Biophysical description	
Catchment name	Oach nala, also known as the Gulana khad
Area	4-5 km^2
Administration	Himachal Pradesh state
Upstream (sellers) profile	
Land owners and managers	Privately-owned farms with some common grazing land. Small area of government managed forest land
Land-use systems	Cultivated 32% Private haylands 12% Forest 39% River 6% Wasteland 11%
Land-use issue	Cultivation and over-grazing leading to erosion causing siltation of the downstream dam
Livelihoods	Small-scale agro-pastoral systems
Downstream (buyers) profile	
Water uses	Domestic; irrigation
Water users	Households; farmers
Distribution	Water is abstracted directly from the small dam on the Oach nala
Payments for watershed services (PWS)	
Core problem	Cultivation and over-grazing leads to erosion causing siltation of the downstream dam
Water service	Water quality and quantity
PWS mechanism	Intra-village agreement to close off upstream grazing area for period of 8 years in exchange for saplings, grass and labour from downstream village
Sellers of service	21 upstream families
Actual/potential buyers	Residents of downstream village
Direct impact	Saplings when mature (in 20 years); increased grass harvest but loss of grazing
Indirect benefits	Increased inter-village cooperation
Status of PWS mechanism	Ongoing
Other	Other soil and water conservation measures planned such as check dams on stream and bamboo barricades
Reference	Agarwal, C., S. Tiwari, M. Borgoyary, A. Acharya and E. Morrison (2007) *Fair Deals for Watershed Services in India*, Natural Resources Issues No. 10. IIED, London.

Indonesia: Brantas	
Biophysical description	
Catchment name	Brantas River
Area	12,000 km^2
Administration	East Java province, Java
Upstream (sellers) profile	
Land owners and managers	The upstream areas have been settled by communities. The government controls the upland forest areas
Land-use systems	Rice fields 27% Gardens 4% Dryland cultivation 23% Forest 27% Settlement 20% Others 1-2%
Land-use issue	Increasing rate of conversion of forest land to agriculture and settlement. This is estimated to cause about 16% of the total silt load. The balance of the silt load is due volcanic eruptions and landslides
Livelihoods	Small-scale agro-pastoral systems with an estimated annual household income of US$240. Significant proportion of the population is landless
Downstream (buyers) profile	
Water uses	Agricultural; domestic; industrial; hydro-electric power
Water users	Estimated 387,000 ha of irrigation Freshwater fishery on Brantas Dam Households in Surabaya, Sidoarjo and Malang by Perusahaan Daerah Air Minum (PDAM – District Domestic Water Company) Heavy and light industry (food, pharmaceuticals, chemical, etc.) 10 hydro-electric power stations on Brantas River
Distribution	Urban water supply abstracted by PDAM at multiple points along river
Payments for watershed services (PWS)	
Core problem	Deforestation causing erosion and siltation of Brantas River
Water service	Water quality
PWS mechanism	PJT1 are paying US$5,800 over a three year period for replanting trees on 40 ha of critical land in two village as well as construction of terracing
Sellers of service	170 members of farmers' group
Actual/potential buyers	PJT1: government river basin authority
Direct impact	Marginal increase to household income
Indirect benefits	60% of revenue invested in business ventures to diversity livelihoods
Status of PWS mechanism	Ongoing
Other	YPP, a locally based NGO facilitated the arrangement and also makes the payment to the farmers groups
Reference	Munawir and S. Vermeulen (2007) *Fair Deals for Watershed Services in Indonesia*, Natural Resources Issues No. 9. IIED, London.

Indonesia: Cidanau	
Biophysical description	
Catchment name	Cidanau River
Area	226 km^2
Administration	Banten province, Java Island
Upstream (sellers) profile	
Land owners and managers	Community Government Perhutani (State Company)
Land-use systems	Small-scale agro-pastoralism and forestry
Land-use issue	Erosion causing high silt and inorganic chemical loads. Turbidity of water in Brantas River has increased 14 fold between 1999 and 2005
Livelihoods	Small scale agro-pastoral systems with an estimated annual income of US$320. Significant proportion of the population is landless
Downstream (buyers) profile	
Water uses	Domestic; agricultural; industrial
Water users	Households (est. 30 million m^3/annum) Irrigation (est. 0.2 million m^3/annum) Heavy and light industry (est. 35 million m^3/annum)
Distribution	Urban user in Cilagong by PDAM Industrial via canal managed by KTI
Payments for watershed services (PWS)	
Core problem	High silt and inorganic chemical loads plus increasing nutrient levels are blocking abstraction and distribution infrastructure. Increasing demand for water by KTI and other industries
Water service	Water quality
PWS mechanism	Replanting 50 ha of critical land with trees. Each farmers group receives about US$80 for every 500 trees planted. Total value of agreement is about US$32,500 over five year years
Sellers of service	72 farmers
Actual/potential buyers	KTI: government owned industrial conglomerate
Direct impact	95% revenue to meet seedling and planting costs. Direct impact low but in the context of falling household income. The net benefit of the replanting is estimated to be: US$ 85/ha
Indirect benefits	5% revenue invested in business ventures to diversity livelihoods. Improved negotiating position with government departments
Status of PWS mechanism	Ongoing
Other	PWS mechanism brokered by Cidanau Catchment Communication Forum (FKDC)
Reference	Munawir and S. Vermeulen (2007) *Fair Deals for Watershed Services in Indonesia*, Natural Resources Issues No. 9. IIED, London.

Jamaica: Buff Bay/Pencar	
Biophysical description	
Catchment name	Buff Bay sub-catchment: Buff Bay River and White River Pencar sub-catchment: Pencar River and Dry River
Area	202 km^2
Administration	Portland and Saint Mary's parishes Upstream (sellers) profile
Upstream (sellers) profile	
Land owners and managers	75% of the catchment is privately owned of which 80% is in small plots <2 ha
Land-use systems	Forest cover 67% Fields – food crops 16% Fields – pasture 6% Coffee plantation 3% Banana plantation 3% Buildings/ infrastructure3% Other 2%
Changes in land use	Estimated loss of 7% of forest between 1991 and 1999 (9 years)
Livelihoods	Upper catchment coffee is the dominant crop. Lower catchment banana production is the dominant crop
Downstream (buyers) profile	
Water uses	Domestic supply; agriculture
Water users	Households in Annotto Bay and Buy Bay settlements
Distribution	
Payments for watershed services (PWS)	
Core problem	Potential contamination due to pesticides, fertilisers and sewage. Some river bank erosion and sedimentation
Water service	Water quality
PWS mechanism	To be determined
Sellers of service	Not relevant
Actual/potential buyers	(Potential) water consumers in coastal areas
Direct impact	Not relevant
Indirect benefits	Not relevant
Status of PWS mechanism	No mechanism developed
Reference	McIntosh, S. and N. Leotaud (2007) F*air Deals for Watershed Services in the Caribbean*, Natural Resources Issues No. 8. IIED, London. Pantin, D. and V. Reid (2005), *Economic Valuation Study: Action learning project on incentives for the Buff Bay/Pencar watershed.* Caribbean Natural Resources Institute, Laventville and IIED, London.

St Lucia: Talvan	
Biophysical description	
Catchment name	Talvan sub-catchment in the Marquis catchment
Area	3.2 km^2
Upstream (sellers) profile	
Land owners and managers	95% of the catchment in private ownership, mostly in small parcels of less than 1.5 ha
Land-use systems	Primary forest 3% Mixed farming 31% Intensive hillside farming 31% Mixed agro-forestry 10% Horticulture <1% Settlement 9% Abandoned cultivation 20%
Changes in land use	Increasing urbanisation and settlement of catchment
Livelihoods	Primarily an agricultural community with some wage employment
Downstream (buyers) profile	
Water uses	Domestic (urban) Domestic (rural)
Water users	Talvan watershed supplies 50% of potable water for Castries.
Distribution	By the Water and Sewerage Company (WASCO). Rural poor abstract directly from the river
Payments for watershed services (PWS)	
Core problem	Poor water quality due to high levels of leached nitrates, pesticide, faecal coliform and grey water discharge
Water service	Water quality
PWS mechanism	To be determined
Sellers of service	Not relevant
Actual/potential buyers	Potential: water and sewerage company and consumers
Direct impact	Not relevant
Indirect benefits	Not relevant
Status of PWS mechanism	No PWS mechanism developed
Reference	McIntosh, S. and N. Leotaud (2007) F*air Deals for Watershed Services in the Caribbean*, Natural Resources Issues No. 8. IIED, London.

South Africa: Sabie-Sand	
Biophysical description	
Catchment name	Sabie-Sand River catchment
Area	7,631 km^2
Administration	Mpumalanga Province
Upstream (sellers) profile	
Land owners and managers	Commercial forestry; commercial farming
Land-use systems	Irrigated agriculture 2% Forestry (plantation and indigenous) 12% Rural settlements 4% Wildlife 82%
Changes in land use	Plantation forestry using alien species decreasing dry season stream flows
Livelihoods	Around 66% of the catchment population live in communal lands and rely on subsistence agriculture and natural resource harvesting, remittances and state support. The rest are either urban residents, private land farmers or resident on mines
Downstream (buyers) profile	
Water uses	Domestic; farming; wildlife
Water users	Households in Bushbuck Ridge settlement Commercial wildlife producers Kruger National Park
Distribution	Water, particularly on wildlife ranches and Kruger National Park, abstracted directly from the river
Payments for watershed services (PWS)	
Core problem	Forestry plantations using alien species are decreasing dry season flows especially in the middle and lower catchment
Water service	Water quantity
PWS mechanism	No mechanism was proposed
Reference	King, N., R. Wise and I. Bond (2008) *Fair Deals for Watershed Services in South Africa.* Natural Resources Issues No. 12. IIED, London. Chapman, A. (2006) *Hydrology and Land Use in the Sand River Catchment.* Council for Scientific and Industrial Research, Pretoria and IIED, London.

South Africa: Ga-Selati	
Biophysical description	
Catchment name	Ga-Selati River
Area	Total catchment 2,338 km^2 Sub-catchment
Administration	Limpopo Province
Upstream (sellers) profile	
Land owners and managers	Limpopo Provincial Nature Authority Commercial farmers (horticulture, livestock and wildlife) Communal land farmers
Land-use systems	Indigenous forest 2% Savanna 75% Degraded 12% Irrigated 3% Dryland 1% Other 7%
Land-use issue	Reduced streamflow caused by invasive alien species in montane grasslands
Livelihoods	Pervasive poverty in the peri-urban settlements of Balloon and Calais typical of former homelands created by apartheid
Downstream (buyers) profile	
Water uses	Irrigation
Water users	Commercial producers of horticulture
Distribution	Diverted into canal by simple weir
Payments for watershed services (PWS)	
Core problem	Decreasing streamflow in upper Ga-Selati River due to alien invasive species and inefficient irrigation methods. Total potential saving by controlling alien species estimated to be 3.6 million m^3 over 10 years
Water service	Water quantity
PWS mechanism	Potential payments from commercial farmers in lower section of upper catchment to clear alien invasive species from Legalametse Nature Reserve
Status of PWS mechanism	No mechanism implemented
Reference	King, N., R. Wise and I. Bond (2008) *Fair Deals for Watershed Services in South Africa.* Natural Resources Issues No. 12. IIED, London. Chapman, A. (2005) *Hydrology and Land Use in the Ga-Selati Catchment.* Council for Scientific and Industrial Research, Pretoria and IIED, London.

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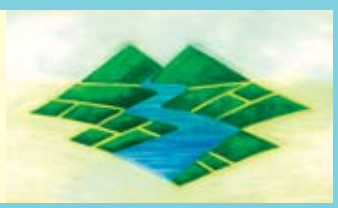
Good clean water where we need it, when we need it – this is taken for granted by some, and is still only a dream for many others. Part of the challenge in meeting our water needs lies in getting to grips with what people are doing 'up in the hills'. Land in the upper catchments may be used in ways that greatly affect the quantity and quality of water we get downstream. To get the water we want we have traditionally relied on regulation, exhortation, cooperation or just keeping our fingers crossed. What about some cold hard cash? What if downstream beneficiaries paid for agreed upstream land uses? This is the idea behind payments for watershed services.

But who will sell, who will buy, and under what conditions? Can this be good for ecosystems and good for reducing poverty too? There is lots of theory about this. This report explores the evidence. It describes what the facilitators in a range of watershed sites around the world have learned in their efforts to establish such payment schemes. It concludes that these payments schemes are difficult to set up – but where they have been set up, they are generally beginning to do some good (there is not much evidence that they do any harm). More significantly, payments schemes – or efforts to set them up – have brought the current winners and losers into the open, and kicked off debate on what can be done. What is now needed is for more 'buyers' to step forward, and for the facilitators of payments for watershed services schemes to put hard-learned lessons from experience into practice at larger scales – ensuring buyers get what they pay for, sellers get a decent price, and watersheds get a fair deal.

Developing markets for watershed services and improved livelihoods



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