CHAPTER

8

PES WITHIN THE CONTEXT OF GREEN ECONOMY

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ABSTRACT

The term 'green economy', while being a debatable concept, is high on the agenda of the UN Conference on Sustainable Development (UNCSD) that will be held in Rio de Janeiro (Brazil) in 2012. The transition towards a green economy will require several integrated actions; a possible theoretical framework for a green growth strategy lead by the public sector is hereby proposed. As a first level of intervention, the public sector is expected to set suitable enabling conditions in terms of legislation, education and research. As a second level of intervention, the public sector should level prices and shape opportunity costs of green economy initiatives by (re)designing incentives and removing/reforming harmful subsidies. Within such a level of market intervention, the public sector is also expected to make direct investments to propel a green economy and enter the market as a buyer through public procurement, labelling, price premiums and Payments for Ecosystem Services (PES). By considering the elements of this framework in depth, it becomes clear that this same theoretical framework also applies to the enabling conditions and the market interventions needed to implement successful PES schemes. The occurrence of so much correspondence between favourable conditions for a green economy and for the implementation of successful PES schemes suggests that PES schemes can be local small-scale field tests of a wider global green economy.

INTRODUCTION

The concept of a 'green economy' has lately gained currency as the world has been searching for solutions to multiple global changes, especially in the midst of the global economic crisis of 2008. The UN Joint Crisis Initiative 4 (JCI-4), led by the United Nations Environment Programme (UNEP), published the *Green Economy Report*, covering all sectors' contributions to a green economy (UNEP, 2011). The UN General Assembly has also selected the 'green economy in the context of sustainable development and poverty alleviation' as one of the main themes of the UN Conference on Sustainable Development (UNCSD) to be held in Rio de Janeiro (Brazil) in 2012.

A 'green economy' should always be considered within the wider context of sustainability and poverty eradication

Current discussions have led to a common understanding of a green economy as a "concept that brings together a suite of policies to promote investment in environmentally-significant sectors, while contributing to the pursuit of sustainable development and poverty eradication. These are derived from a range of economic approaches, concepts, ideas and principles, many of which have been articulated over the past 20 years" (UNEP, 2010). However, when the first Preparatory Committee of the UNCSD met in May 2010,

it appeared that there was still no complete consensus on what a green economy entails, nor what its relationship is with the broader concept of sustainable development (UNCSD, 2010).

A green economy is historically understood as an economic system that endorses the responsibility of environmental protection. Today, the concept of a green economy has evolved to also consider social improvements. By using clean technology and clean energy, a green economy is expected to provide safer and healthier environments, create alternative green jobs[1] and preserve the development of societies (UNEP, 2008). The concept is often also associated with ideas, such as 'low-carbon growth' or 'green growth'. In the context of a green economy, the term 'growth' does not simply mean economic output growth, but indicates 'sustainable economic progress'. In fact, a green economy aims to overcome the reductionist approach that has considered Gross Domestic Product (GDP) as a simple measure of overall market economic activity as a signal of progress and societal well-being. This GDP-focussed approach proved to be misleading, as the current climate and economic crisis clearly demonstrates that growth is unsustainable with over-exploitation; in fact, destroying natural capital hampers present and future livelihoods.

Therefore, 'low-carbon growth' and 'green growth' are different ways to express the paradigm shift that no longer positions 'green' against 'development', but rather seeks ways to enforce sustainability. Sustainable development is the highest priority in global and national agendas and a green economy can be considered as a multi-faceted pathway to this goal. Each country has its own specific pathway and will design its own policies, institutional structures and implementation measures, depending on national resource endowments, challenges, needs and priorities (UNEP, 2009).

There is general agreement that the definition of a green economy should always be considered within the wider context of sustainability and poverty eradication. The implementation of a green economy must be consistent with the 27 sustainability principles identified in 1992 Earth Summit (UN, 1992). According to these principles, each country has the right to development (principle 3) and the responsibility of protecting the environment as an integral part of the development process (principle 4). Moreover, in the global international scenario, a key principle to achieve equity and justice is that countries will have 'common but differentiated responsibilities'.[2,3] This recognises the historical differences in the contributions of developed and developing countries to global environmental problems, as well as the differences in their respective economic and technical capacities to tackle these problems.

1 Green jobs are defined as work in the agricultural, manufacturing, research and development, administrative and service sectors that contribute substantially to preserving or restoring environmental quality. Specifically, but not exclusively, this includes jobs that help to protect ecosystems and biodiversity; reduce energy, materials and water consumption through high efficiency strategies; de-carbonise the economy; and minimise or altogether avoid generation of all forms of waste and pollution (UNEP, 2008).

2 The Rio Declaration states: "In view of the different contributions to global environmental degradation, states have common but differentiated responsibilities. The developed countries acknowledge the responsibility that they bear in the international pursuit of sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command."

3 The UN Framework Convention on Climate Change (UNFCCC) states that parties should act to protect the climate system 'on the basis of equality and in accordance with their common but differentiated responsibilities and respective capabilities'.

MAIN ELEMENTS OF A GREEN ECONOMY

A green economy embraces a vision that tries to steer economic development in the direction of sustainability. According to the current understanding of the green economy concept, there are five main elements which support the transition to a more sustainable pattern of production and consumption (Table 13).

Being referred to as also a 'low-carbon[4] economy', a green economy is strongly commited to the use of renewable energy resources, such as wind, hydropower, biofuel, photovoltaic, solar, thermal and solid waste; seeks management approaches and new technologies that increase energy efficiency in all economic sectors; aims to reduce waste and improve waste-energy conversion; takes action to preserve natural capital or to make sustainable use of it; and boosts employment through the creation of green jobs.

These five elements of change can be implemented in all economic sectors: the primary sector, which transform natural resources into primary products and includes agriculture, forestry, fishing and all mining and quarrying industries; the secondary sector, which takes the output of the primary sector and manufactures finished goods; and the tertiary sector, which provides information and a variety of services. For all sectors, the aim is to establish — to the maximum extent possible —

Table 13
Brief description of the main elements of a green economy

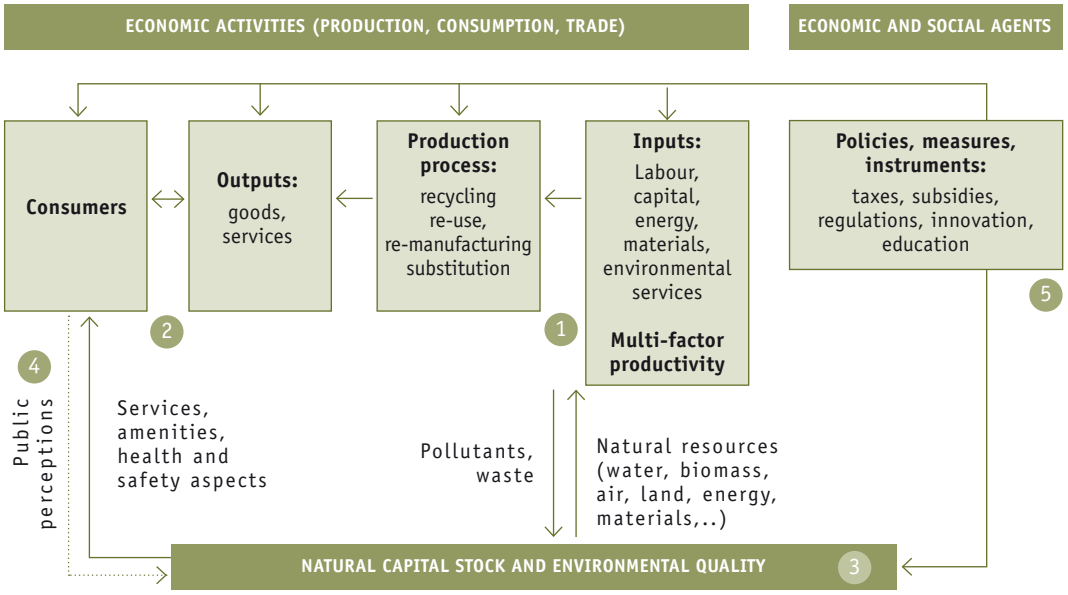
Generation and use of renewable energy	Refers to any source of usable and renewable energy intended to replace fossil fuel sources without the undesired consequences of greenhouse gas emissions and other pollutants derived from fossil fuel combustion
Energy efficiency	Seeks to adopt the means and a more efficient technology that uses less energy to provide the same level of energy service
Waste minimisation and management	Considers different approaches from prevention, minimisation, reduction, reuse, recycling, waste conversion and disposal in order to ensure that the use of materials and waste generation remains within the regenerative and absorptive capacities of the planet
Preservation and sustainable use of existing natural resources	Recognises the importance and economic value of natural resources, such as freshwater, forests, soils, coral reefs and ecosystem services provided by functional and healthy ecosystems
Green job creation	Promotes decent jobs that offer adequate wages, safe working conditions, job security, reasonable career prospects and workers' rights

4 The term 'carbon' is used for all greenhouse gases, as carbon emission calculations convert methane and nitrous oxide into carbon-equivalent units.

closed or semi-closed nutrient and energy cycles and, at least, minimise waste and boost recycling. In a green economy framework, all economic activities are characterised by the use and respect of natural capital stocks and environmental quality. Environmental efficiency is regulated and checked with feedback loops at different levels: by policies and the responses of economic actors, by indicators of stocks of natural capital and environmental quality, by production and consumption patterns and by public perception of environmental quality and life satisfaction (Figure 35).

This transition and conversion in the modality of production is also expected to create an employment shift. Alternative green jobs can be created in all economic sectors: some employment will be substituted, certain jobs may be eliminated without direct replacement, many existing jobs will simply be redefined and profiles will be greened. However, concerns still persist about possible job losses during a green economy transition and the need to evaluate unemployment rates and investments in social protection, job re-training and capacity building (UNEP, 2008).

Figure 35
Framework for a system of indicators on green growth



LEGEND

1. Indicators of environmental efficiency of production and changes in production patterns
2. Indicators of environmental efficiency of consumpion and changes in consumpion patterns
3. Indicators of stocks of natural capital and environmental quality
4. Indicators of objective and subjective environmental quality of life
5. Indicators of responses by economic actors

Adapted from OECD, 2010

FRAMEWORK FOR A GREEN GROWTH STRATEGY DRIVEN BY THE PUBLIC SECTOR

The transition towards a green economy will require political will and economic investments in order to restructure the present model of development. The report by UNEP (2011) has pinpointed different enabling conditions and supporting actions for a transition towards a green economy. Considering the results of UNEP's analysis, a framework for a public sector-driven green growth strategy is hereby proposed (Figure 36).

For green economy activities to be attractive, viable, profitable and supported by society, certain conditions may need to be changed, shifted or created. These conditions, commonly referred as 'enabling conditions', have roots in institutional and legal frameworks, education and research and market equilibria. The depth and ramifications with which conditions are interlocked with the development of a green economy varies amongst countries, according to specific historical, political, geographical, economic and cultural contexts.

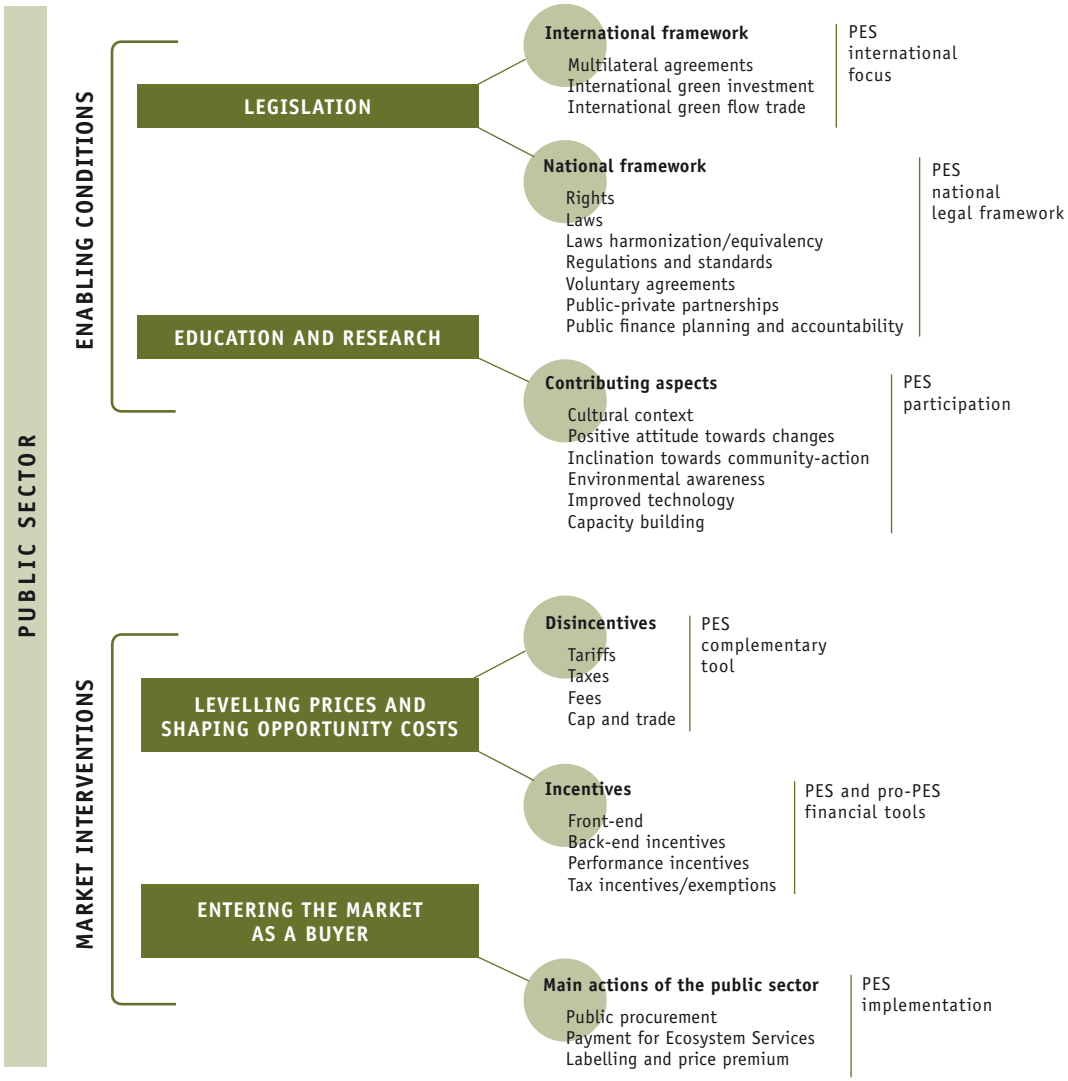
As a first level of intervention, the public sector is expected to set suitable enabling conditions both in terms of legislation, as well as in education and research. Once the legal framework and social consensus support the development of green economy activities, the public sector can start playing a major role in market interventions. In particular, the public sector is able to level prices and shape the opportunity costs of green economy initiatives by (re)designing incentives and removing/reforming harmful subsidies. In most cases, in order to make positive incentives rewarding, complementary disincentives may need to be enforced. Although the levelling the field of prices, is still part of setting enabling conditions in the economic sector, this intervention has a strong operational aspect. Thus, it can be considered a primary type of market intervention led by the public sector for green growth.

The public sector should set enabling conditions for a green economy by intervention in legislation, education and research

As a second level of intervention, the public sector is also expected to make direct investments in a green economy and enter the market as a direct buyer. In this way, the public sector can open and support new market avenues, provided that there is convergence with other market instruments in place. For example, attention must be given to existing subsidies and tax breaks that would hinder the full-scale development of a vibrant green economy. Also, public procurement is often weighted against lowest-price competitive tendering and is subject to significant pressure in times of public expenditure cutbacks.

Therefore, procurement based on non-price factors, such as environmentally-produced goods, needs to be justified in terms of its overall public benefits. In brief, by levelling prices

Figure 36
Framework for a public sector-led green growth strategy and correspondence with favourable setting for PES implementation



and setting opportunity costs for different green economy activities, the public sector can create enabling conditions for investments and business, driven by a multitude of different stakeholder groups, including international business companies, public-private partnerships, private sector, NGOs, etc.

A GREEN GROWTH STRATEGY AND PES

Looking at the above-mentioned green growth strategy, it can be asked: how does the implementation of PES fit into this framework? What could be the likely contribution of PES to a green economy? Are enabling conditions for a green economy conducive to PES requirements?

A concrete way to move towards sustainable development is to guarantee the good functioning and delivery to society of all types of ecosystem services, including: supporting services (e.g. biodiversity, photosynthesis, nutrient cycling, soil formation); provisioning services (e.g. food, water, wood, fibre, fuel); regulating services (e.g. climate stabilisation, flood prevention, drought control, water purification, disease regulation, predation, pollination); and cultural services (e.g. recreation, aesthetic experience, cognitive development, relaxation, spiritual reflection) (MEA, 2005). Clearly, PES is a market tool through which the public sector can directly and actively enter a green market and become a 'buyer' of ecosystem services. A deep insight reveals that the PES mechanism is strictly inter-linked to the enabling conditions and supportive actions that enable a green economy as a whole.

The public sector should become a buyer in Green Public Procurement, PES schemes and labelling and price premium initiatives

In the following sections, each component of the framework for a green growth strategy led by the public sector is analysed (Figure 36), with concrete examples of how the different types of enabling conditions and interventions are linked to the successful implementation of PES schemes.

LEGAL ENABLING CONDITIONS FOR PES

International frameworks

Multilateral agreements and international green trade

At the international level, the key multilateral agreement that had major repercussions on the establishment of virtual markets for the trade of natural resources has been the introduction of the Reduction of Emissions from Deforestation and Forest Degradation (REDD) for climate change mitigation. Deforestation and degradation account for around 20 percent of global anthropogenic greenhouse gas emissions, widely understood to drive climate change. The rationale of REDD is simple: countries that are willing and able to reduce emissions from deforestation should be financially compensated for doing so.

The PES mechanism is strictly inter-linked to the enabling conditions and supportive actions that enable a green economy

The process has been lengthy and the final situation is still viable for the effective conservation of forests. In the 1997 global climate agreement, the Kyoto Protocol, policies related to deforestation and degradation were excluded. In 2005, at the UNFCCC COP-11, the Coalition of Rainforest Nations initiated a request to consider the reduction of emissions from deforestation in developing countries. In 2007,

COP-13 agreed that a comprehensive approach to mitigate climate change should include "policy approaches and positive incentives on issues relating to reducing emissions from deforestation and forest degradation in developing countries (i.e. commonly addressed by REDD programmes) and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries (i.e. commonly addressed by REDD+ programmes)" (Parker *et al.*, 2009). In 2009, COP-15 introduced an agreement (not legally-binding though) for including agriculture and wetlands in the Kyoto Protocol. It was also proposed that REDD be considered as a multi-level nested PES scheme, ranging from the international to the sub-national level (see also Chapter 7 "Enabling conditions and complementary legislative tools for PES").

However, one of main key issues for REDD to become an effective tool to help reducing carbon emissions and contributing to the preservation of natural capital is the definition of 'forest'. According to the Clean Development Mechanism (CDM) of the Kyoto Protocol, a 'forest' is an area of more than 0.5–1.0 ha with a minimum 'tree' crown cover of 10–30 percent, with 'tree' defined as a plant growing to a height of 2–5 metres (UNFCCC, 2002). Participating countries can choose from the specified ranges for a 'forest' definition by setting different values for the minimum tree crown cover, the minimum area and the minimum tree height. While any definition suitable for global application will necessarily be composed of a few easily measured parameters, the range of the proposed parameters jeopardises the conservation of many forests and allows continued unsustainable exploitation of forest resources. In fact, the present ranges of crown cover, tree height and tree patches do not allow for discrimination between natural forests and plantations, while the thresholds for crown cover are so low that they do not capture the carbon consequences of logging of commercially valuable tree species (Sasaki and Putz, 2009).

International green public investment

The Marrakech Process on Sustainable Consumption and Production is an initiative led by UNEP and the United Nations Department of Economic and Social Affairs (UNDESA).[5] It has seven different task forces entrusted to internationally promote sustainable patterns of production and consumptions. Amongst them, there is a task force to promote Sustainable Public Procurement (SPP) by scoping existing supply-side capacities in sustainable goods and services, with a view to develop country-based SPP. Clearly, such an initiative at the international level is expected to have a major impact in the role of the public sector of participating countries as buyers in the green market.

Sustainable Public Procurement could enable countries to green the pattern of production and consumption

5 http://esa.un.org/marrakechprocess/taskforces.shtml

National legal frameworks

Rights

PES contractual agreements are largely based on land tenure. Land tenure is the relationship, whether legally or customarily defined, among people, as individuals or groups, with respect to land (FAO, 2002). Land tenure includes different types of rights: access and use rights, control rights and transfer rights (Table 14), thereby determining who can use what resources, for how long and under which conditions (FAO, 2002). Within the categories of use, control and transfer rights there are many different rights, such as the right to exclude unauthorised people from using the owned land, a right to control and decide how the land will be used, a right to derive income from the land, a right to protection from legal expropriation from the owned land, a right to transmit the rights to the land to one's successors, etc. (FAO, 2002). These different rights can be exist as bundled rights or can exist as separate rights involving different actors.

Land tenure includes various types of rights, which determine who can use what resources, for how long and under which conditions

The definition of clear property rights is a pre-requisite for PES implementation. In areas where there are no statutory rights or formally recognised rights (i.e. explicitly acknowledged

Table 14
Property, ownership rights and laws

Who has property rights	Type of ownership rights	Statutory or customary laws
Public (held by the state)	Access and use rights (rights to access the land to use its natural resources)	Statutory law (the written and codified law of a country including both state and municipal legislation)
Private (held by a natural or legal person)	Control rights (rights to make decisions on how the land and its natural resources should be used)	Customary law (traditional rules, norms and customs)
Communal (held by each member of a community)	Transfer rights (rights to sell, convey, mortgage, reallocate access, use and control rights and transmit the land to heirs)	
Openly accessible (not assigned to anyone)	Not specified	Not specified

Adapted from Greiber, 2009

by the state and which may be protected using legal means; FAO, 2002), the preliminary phase of a PES scheme can include the legal allocation of land property rights. On the other hand, PES can also be applied in situations where there are customary and/or traditional rights (i.e. informal, as they lack official legal recognition), but the *de facto* are considered as formal and secure in their own social context (Greiber, 2009).

In the implementation of REDD, other specific rights linked to the forest use and management should also be considered. These rights include usufruct rights, commercial rights on some timber species and carbon property rights. In particular, under the REDD policy, once forests become a product that can be traded, the issue of forest and carbon ownership becomes critical.

The framework for REDD in Ghana provides an example on how these different legal layers interact with each other. About 80 percent of land in Ghana is under the ownership and control of customary authorities in the form of stools/skins (i.e. families, clans and heads of communities), with the remaining 20 percent owned by the state. As for trees, those that naturally grow on the land are owned by customary authorities, while commercial rights to timber species are owned by the state despite of where they grow. Thus, farmers usually do not have tree tenure on timber species naturally occurring on their land. The Katoomba Group questioned whether they had the rights to the REDD benefits of carbon storage if they could not own the trees (The Katoomba Group, 2009). In Ghana, farmers have the user rights to cut trees and natural vegetation for agricultural purposes though, so clearing land is also a way in which land property is informally claimed. Thus, in Ghana, for REDD to work, a PES scheme should secure and clarify property rights and, at the same time, compensate the farmers for the opportunity cost of clearing their land.

Communal management and ownership of forests is very common in developing countries; of the 233 countries and areas covered by FRA (2010) about 20 percent of the private-owned forests are formally recognised as community reserves or community-owned. If the state decides to retain carbon property rights, the government will control all the potential benefits. Communities (or other stakeholders) will not have additional motivation to protect forests unless their benefits will be secured and guaranteed by a clear legal mandate. Legal recognition of land titles can be a pro-poor strategy, as farmers' incomes can significantly increase, as in the case of Sumberjaya, Lampung province (Indonesia), as they no longer have to pay bribes to keep from being evicted from their lands (see Case Study 13 "PES and multi-strata coffee gardens in Sumberjaya, Indonesia")

When property rights on land tenure are clarified and formalised, a well-defined legal apparatus is also needed to enforce property rights and contest land claims when they arise (Greiber, 2009).

Laws

The importance of a legal framework for successful PES development varies with the type of PES scheme. A private PES scheme, in which both the buyer and seller are private entities, uses basic legal requirements for agreements contracts (see also Chapter 7 "Enabling conditions and complementary legislative tools for PES").

In a public PES scheme, the public sector is involved as at least one of the contracting parties. In this case, the legal framework should provide the authority to a public entity to enter into legal agreements. The statutory legislation should also determine the rights and responsibilities of an independent authority that should monitor and supervise the process to ensure transparency (Greiber, 2009). A PES-specific legislation can be created with some clear advantages. However, according to the extent to which the legislation is developed and harmonised, some disadvantages might also occur (Table 15). If legal uncertainty arises by incomplete PES-specific legislation, this can be a strong disincentive for the buyer and seller to enter into an agreement. A general criterion of PES-specific legislation is that, while aimed at facilitating PES development and implementation, prescription in the legislation should be kept at minimum to avoid over-regulation and bureaucracy.

There are no golden rules for an ideal institutional setup but they should be adapted to the local circumstances

There are no golden rules for an ideal institutional setup. On the contrary, institutions, which include both the national legal framework and the government system structure, should be adapted to local circumstances.

To date, PES-specific laws exist in Argentina and Costa Rica. In Argentina, Law No. 26.33185 defines ecosystem services as the tangible and intangible benefits generated by ecosystems that are necessary for the survival of natural and biological systems, as well as for the well-being of Argentineans (Lugo, 2008). In Costa Rica, Forest Law No. 7575, enacted in 1996, explicitly acknowledges four categories of ecosystem services that are delivered by forest ecosystems: mitigation of greenhouse gas emissions; hydrological services (which includes water for human consumption, irrigation and energy production); biodiversity conservation; and scenic beauty for recreation and ecotourism. This law provides the regulatory basis to compensate landowners for the services provided by their lands and, for this purpose, established the National Fund for Forest Financing (Fondo Nacional de Financiamento Forestal, FONAFIFO) (Pagiola, 2006).

As PES uses basic legal requirements for agreements contracts, there is no need for constitutional recognition of PES. However, existing laws should not indirectly disrupt the development or the success of PES schemes (Greiber, 2009).

Table 15
Advantages or disadvantages of a PES-specific law

Advantages	Disadvantages
Attention drawn to PES in general	
Awareness raised for PES as a legitimate policy instrument	
Comprehensive codification developed	Environmental legislation further fragmented
Scope of PES instruments clarified	Complexity of legal framework increased
Legal certainty created	Conflicting legal framework created
Implementation supported	Implementation hampered

Source: Greiber, 2009

Law harmonisation/equivalency

If PES is regulated in a PES-specific law, attention must be paid to its integration in the existing legal and institutional frameworks, in particular those laws that regulate ecosystem management. Two opposite examples are found in Costa Rica and Indonesia. Legislation in Costa Rica prohibits forestry clearing and this reinforces the potential success of PES forest conservation programmes.

By restricting the range of income-generating options from forested land, this legislation makes PES more economically attractive. On the contrary, legislation in Indonesia provides government subsidies to farmers who clear land for conversion to rubber monoculture. This stands against the success of a PES scheme that provides incentives to farmers to maintain mixed jungle-rubber agroforestry systems (see Case Study 4 "PES and rubber agroforestry in Bungo district, Indonesia").

Regulation and standards

Regulation and standards have crucial roles to play, as PES programmes often operate in contexts in which various command-and-control regulations pre-exist. In some situations, the occurrence of PES can be complementary to existing regulations; PES can be thought of as providing a carrot that makes the stick of regulations more palatable. In other cases, conflicting regulations can provide indirect benefits for non-compliance with PES agreements and/or can indirectly determine very high opportunity costs for PES schemes.

A 'perfect PES case', as described in Perrot-Maître (2006), in which existing regulations were proactive in the establishment of PES, is the Vittel (Nestlé Waters) privately-financed programme implemented in a 5 100 ha catchment in the Vosges Mountains (northeastern France) for the maintenance of high water quality. Since 1993, Vittel has been paying 26 farmers in the watershed to adopt best low-impact practices in dairy farming; long-term contracts (18-30 years) and payments are adjusted according to opportunity costs on a farm-by-farm basis. Land-use and water quality are monitored over time and this has provided evidence of improvement in relevant ecosystem services, compared to an otherwise declining baseline. This programme took almost ten years to be fully implemented. The interest of this private company in securing a successful PES programmes arises from the fact that, in France, regulations on natural mineral water are very strict. Standards for a 'natural mineral water' label require the elimination of naturally-occurring unstable elements (such as iron and manganese), no pesticides and no more than 4.5 mg of nitrates per litre of water. Even more important, the legislation does not allow the treatment of natural mineral water. As the legislation makes payments to farmers the cheapest solution, it has induced a market strategy by Nestlé Waters; a similar approach is being followed by other mineral water brands, such as Perrier and Contrex (Perrot-Maître, 2006).

Regulations and standards have crucial roles to play, as PES programmes often operate in contexts in which various laws pre-exist

Standards can be also voluntary, as practiced by the agri-food industry, through environmental labels (e.g. Rainforest Alliance, Marine Stewardship, Forest Stewardship, biodynamic agriculture) that are in demand by environmentally-aware consumers willing to pay price premiums for quality and/or specialty products. For example, organic markets (currently representing two percent of global food retail) have grown for decades on the basis of voluntary standards; labels relating to Geographical Indications are also very common. In such markets, the fact that consumer demand is the main driver of growth stresses the importance of building awareness on the benefits of internalising environmental values in commodity prices.

Voluntary agreements

Amongst possible tools to mainstream a green economy, PES and other voluntary agreements are particularly promising when the regulatory capacity is weak or where there is no regulatory authority at all. In the case of PES, its voluntary nature also poses some constraints for the implementation of eco-efficient solutions in ecosystem management: the possibility for landowners to withdraw from a contract at any time; the likelihood of landowners not joining the programme to act as free-riders or to become an obstacle to the success of the programme;

or the eventual lack of spatial connectivity amongst land plots subject to the PES programmes (see Viewpoint 3 "PES design: Inducing cooperation for landscape-scale ecosystem services management").

Public-private partnerships

Attracting green investments is one of the major accelerators for green growth. In some cases, governments leverage private investments in specific areas by co-investing through public-private partnerships, which enables market conditions attractive to private investments (UNEP, 2011). As such, PES schemes constitute a very flexible tool that can attract private investments, as well as public-private partnerships. The key issue in deciding the possibility or the degree to which ecosystem services could be privatised though relates to the extent to which they are public goods.

Planning and accountability of public finance

In some countries, PES schemes could be hampered by the short-term planning and accountability systems of public finance. For example, in the Cidanau watershed of Indonesia, major difficulties were encountered in 2002 by the PES programme, as the government budget plan was applicable only for one year (Budhi *et al.*, 2008). Usually, the implementation of PES requires a PES contract of at least 5-10 years, implying a multi-year public budgeting commitment. This remains a key hurdle in public financing though, considering the relatively short election cycles.

EDUCATION AND RESEARCH ENABLING CONDITIONS FOR PES

Environmental awareness

Environmental awareness influences the daily choices and investments of different stakeholders, whose behaviour in turn affects the opportunity costs and market avenues for green public and private investments. Motivational drivers also influence the willingness to participate in PES programmes (see Chapter 5 "Social and cultural drivers behind the success of PES"). For example, a survey was carried out in Florida to examine the willingness of private forest owners to participate in a conservation programme that required adopting silvicultural management practices beyond the existing regulations. The survey of 1 500 randomly sampled forest owners revealed that forestry and conservation organization membership, which can be considered as a proxy for environmental awareness, increased the probability of forest owners to participate in the programme (Matta *et al.*, 2009).

Cultural context

The cultural context can encourage the development of policies and institutions to achieve social equity and respect for natural resources. For example, the Andean Water Vision,[6] built on indigenous culture, requires water to be considered as a public property in the constitution and under the control of society as a whole. In this cultural context, PES can be considered socially inappropriate and there may be strong resistance towards PES for water provision and water quality, particularly if this is accomplished through an agreement with the private sector.

Positive attitude towards changes and inclination towards community action

Communities are often heterogeneous and the degree of inclination towards community action varies according to its members. In Ecuador, a biodiversity PES programme led by the Deutsche Gesellschaft für Internationale Zusammenarbei (GTZ) and Conservation International was agreed to in 2004 with three communities, comprising approximately 300 households, living in the Gran Reserva Chachi, an area of high biodiversity value facing strong pressure from timber companies and the expansion of oil palm plantations. The success of this PES programme varied among the three communities, depending on the inclination of individuals to abandon the income earned from logging and traditional subsistence wildlife hunting (Wendland, 2008).

Improved practices, technology and capacity building

A green economy relies highly on improved management practices, technology and capacity building to achieve renewable energy generation and energy efficiency. Improved green technology and the ecosystem approach to management can indeed be the focus of some PES schemes. In fact, while PES forest schemes for biodiversity conservation or carbon sequestration call for retaining existing land uses, other PES schemes foster the adoption of silvo-pastoral (Pagiola *et al.*, 2007; Rios and Pagiola, 2009) and agro-ecological practices (Turpie *et al.*, 2008).

6 http://www.condesan.org/memoria/agua/AndeanVisionWater.pdf

Improved technology, which is mainstreamed in some PES schemes, is promoted to avoid soil erosion, contamination of water supplies, air pollution and landscape degradation. Farmers enrolling in these PES schemes usually learn how to terrace their lands, to plant trees and shrubs in areas of degraded pastures, to use local and fast-growing trees and shrubs for fencing and wind-screens and/or to clear alien invasive trees. It has been suggested that a PES scheme could also be designed to allow farmers to suggest, invent and adopt innovative approaches (Jack *et al.*, 2008). Rewarding the target without binding the farmer to certain practices could encourage farmers to experiment and also implement innovative approaches to comply with the PES requirements. It is assumed that when innovations to achieve renewable energy generation and energy efficiency become available or adopted at a large scale, PES schemes could be a possible way to encourage and disseminate the use of different practices and technologies.

PES schemes could be a possible way to encourage and disseminate the use of different practices and technologies

LEVELLING PRICES AND SHAPING OPPORTUNITIES COSTS FOR PES

The opportunity cost of different investments and activities is highly dependent on the resulting interaction in the market between incentives and disincentives. Redesigning existing incentives per se can be extremely efficient in redirecting the economy in a greener direction. For example, when Ghana reformed its fuel subsidies, primary and junior-secondary school fees were eliminated; the government also made extra funds available for primary healthcare programmes concentrated in the poorest areas (IMF, 2008). Furthermore, it is generally more efficient to raise the cost of unsustainable activities through regulations or instruments that help price them at their true cost, thereby making sustainable alternatives relatively more attractive.

Disincentives

Tariffs

Tariffs are usually applied to the trade of some products or can be feed-in tariffs, where the cost of the production of a product or activity is included into its price. For example, in the town of Heredia (Costa Rica), the introduction of a near-zero nominal fee applied to all water users was able to finance PES schemes aimed at improving the quality of water provided to Heredia town from the forested upper watersheds (see Case Study 12 “PES for improved ecosystem water services in Heredia town, Costa Rica”).

Taxes

Tax applications and exemptions could be another tool through which the public sector can influence consumers and citizens choices. In particular, the vision of green taxes is based on the principles of 'the polluter pays' and 'tax what you take, not what you make'. The revenue that is raised from such taxes can be used in a variety of ways: to help undo the damage done by unsustainable production and consumption; to promote green economy activities; or to contribute to other priority areas where government spending for society is necessary.[7] For example, in Costa Rica, the bulk of the PES programme financing has been obtained by allocating 3.5 percent of the revenues from a fossil fuel sales tax (about USD 10 million a year) to the National Fund for Forests Financing (FONAFIFO) (see also Chapter 4 "Cost-effective targeting of PES").

Fees

Fees can be applied by users of certain goods with rates charged differently to certain user groups (e.g. commercial, non-commercial) and/or can be associated to a permit or a concession. The revenue raised by such fees can be reinvested into green activities generating positive feedbacks. For example, in Germany, the Bundesländer (Federal State) applies groundwater extraction fees to water utility companies, part of which is used to pay farmers for the provision of ecosystem services encouraging them to reduce use of nitrogen-based fertilisers and pesticides. The resulting synergy between water utilities fees and environmentally-friendly agronomic practices ensures the protection of groundwater and, thus, provides improved water quality and use for both the farmers and the water utilities companies. The success and popularity of very simple PES programmes, such as the one just described, can be measured by its scale of implementation. In 2002, 33 000 farmers and over 850 000 hectares (i.e. five percent of agricultural land in Germany) were involved in the programme (TEEB, 2009).

Cap-and-trade

Cap-and-trade is another market tool that can be used for national and international markets. By establishing a cap (i.e. an aggregate maximum amount), this regulation allocates permits which divide the allowable overall total among users of natural resources and allows trading of permits between those who do not need permits and those who need more than their allocation. The linkage between cap-and-trade mechanisms and PES is clearly shown by the carbon finance cap-and-trade system and REDD (see also Chapter 7 "Enabling conditions and complementary legislative tools for PES").

Incentives

Front-end incentives

Front-end incentives are often a major propeller of change as they provide financial resources for any change to be implemented. In PES, front-end incentives might be very important if the programme aims to involve the poorest stakeholders. Front-end incentives might cover transaction costs, which often in very tight household budgets constitute one of the major constraints to programme participation (see also Chapter 6 "Landscape labelling approaches to PES: Bundling services, products and stewards").

Back-end incentives

The current rewards of PES can be considered as back-end incentives that are given once the negotiation phase has been concluded and the contract has been agreed and signed by the two counterparts.

Performance incentives

Performance incentives are a form of direct-payment made upon verification of a tangible direct effect that can signal the success of the PES scheme. PES based on performance aims to overcome the drawbacks usually existing between indirect-payment conservation interventions (e.g. eco-friendly commercial activities) and the preservation of ecosystem services.

For example, in order to foster forest conservation in Madagascar in 1991-1995, an indirect-payment conservation initiative provided beehives to farmers. Given that honey production requires nectar and pollen inputs from rainforest plants, it was thought that beekeeping would provide the incentive needed for forest conservation. However, Ferraro and Simpson (2002) discussed that the implementation of this initiative might have led to the opposite effect. In fact, honeybees feed on a small set of forest plants that have a heterogeneous distribution; thus, the interest of the farmer could only be directed to conserve some patches of forest and not the whole forest extent.

Moreover, the farmer could be led to manipulate forest species composition and eliminate the 25 percent of forest species on which honeybees do not forage. Farmers could also detect that, in some cases, a consistent percentage of the pollen came from secondary forests and exotic plantations and this might reduce their interest in conserving their forest patches. Last by not least, farmers could not prevent honeybees from neighbouring fields from foraging on their forest patches, thus they decided that the best course of action was to convert their forest patches into agriculture fields and allow honeybees to forage on neighbouring forest parcels and/or plantations instead.

To overcome these possible drawbacks, PES schemes try to establish a direct link between the payment/rewards and the provision of ecosystem services. The agreement is meant to be conditional on the continuous delivery of this service. While back-end incentives are usually issued as a consequence of the end of a negotiation/implementation process, performance incentives are meant to be issued on the basis of a monitoring process.

Some PES schemes have a payment scheme that includes an initial baseline payment, followed by additional payments based on degree of performance/success recorded. For example, on Mafia Island (Tanzania), a PES project was established for the protection of a population of green turtles (*Chelonia mydas*) almost driven to extinction by poaching activities. A fixed amount was delivered for finding and reporting a nest, while additional variable payments were delivered as a function of the nest's hatching success (Ferraro, 2007). This payment scheme was aimed at ensuring the effective increase of turtle birth rate and at discouraging possible leakage (i.e. the contractor first receiving payment to detect the nest and subsequently being able to exploit the nest).

Some PES schemes include an initial baseline payment, with additional payments based on the degree of performance/success recorded

An even better articulated example of performance incentives is given by the Silvopastoral Ecosystem Management project to increase carbon sequestration and biodiversity conservation (Rios and Pagiola, 2009). Farmers received an initial baseline payment as recognition of the ecosystem services that were preserved by them until that moment, with no obligation to participate further in the programme. Once enrolled in the PES programme though, farmers received compensation proportional to the amount of land-use change that was detected on their lands.

Tax incentives/exemptions

In a green economy, tax exemption can be considered as a way to provide preferential support to the development of new technologies, practices and markets. As taxes are considered one of the main means of achieving long-term funding for PES, tax exemption linked to a PES should be always evaluated within a larger framework of equity and social justice.

Entering the market as a buyer

There are mainly three ways in which the public sector can enter the market as a direct buyer: through public procurement (by sourcing environmentally-friendly products and, thus, encouraging the production of environmental goods and services); through labelling (by regulating environmental labels, thus ensuring fair play in terms of price premiums whereby consumers

pay for environmental stewardship); and through PES (UNEP, 2011). Ecosystem services can be a critical tool for the public sector to administer, preserve and restore public goods, while opening green development pathways.

STRENGTHENING A GREEN ECONOMY WITH PES

The real contribution of PES to a green economy depends primarily on the capacity to design sustainable PES programmes

Consideration of the various elements of a green growth strategy reveals that most enabling conditions are also crucial for the implementation of PES schemes. This implies that green growth policies can highly influence the success of PES schemes. Similarly, PES schemes, depending on the scale of their implementation, can promote social acceptance and stakeholder participation in a green economy. PES will certainly contribute to the understanding of the importance of the ecosystem services, bringing ecological awareness and active social participation in governance. Moreover, PES schemes could be implemented with respect to the equity principle; the green jobs concept could, in fact, be designed to mainstream preservation of ecosystem services and poverty alleviation. **PES** is not a silver bullet though and clearly **will not work if**:

- **Governance is weak and unable to set favourable enabling conditions**;
- **Transaction costs are very high**, for instance, due to land fragmentation;
- **Competing destructive resource usages are highly lucrative**;
- **Resources tenure or use rights are insufficiently defined or enforced**.

However, under such circumstances, it is unlikely that governments will have effective alternative tools to properly manage ecosystem services, as command-and-control regulations will also be likely to fail. Thus, a negative evaluation obtained during a feasibility study for a PES project can be important to pinpoint priority areas of intervention in the market and relevant institutions. The real contribution and efficacy of PES to the development of a green economy depends primarily on the capacity to design sustainable PES programmes.

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PES DESIGN: INDUCING COOPERATION FOR LANDSCAPE-SCALE ECOSYSTEM SERVICES MANAGEMENT

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Based on: Goldman, R., Thompson, B.H. & Daily, G.C. 2007. Institutional incentives for managing the landscape. Inducing cooperation for the production of ecosystem services. *Ecological Economics*, 64: 333-343.

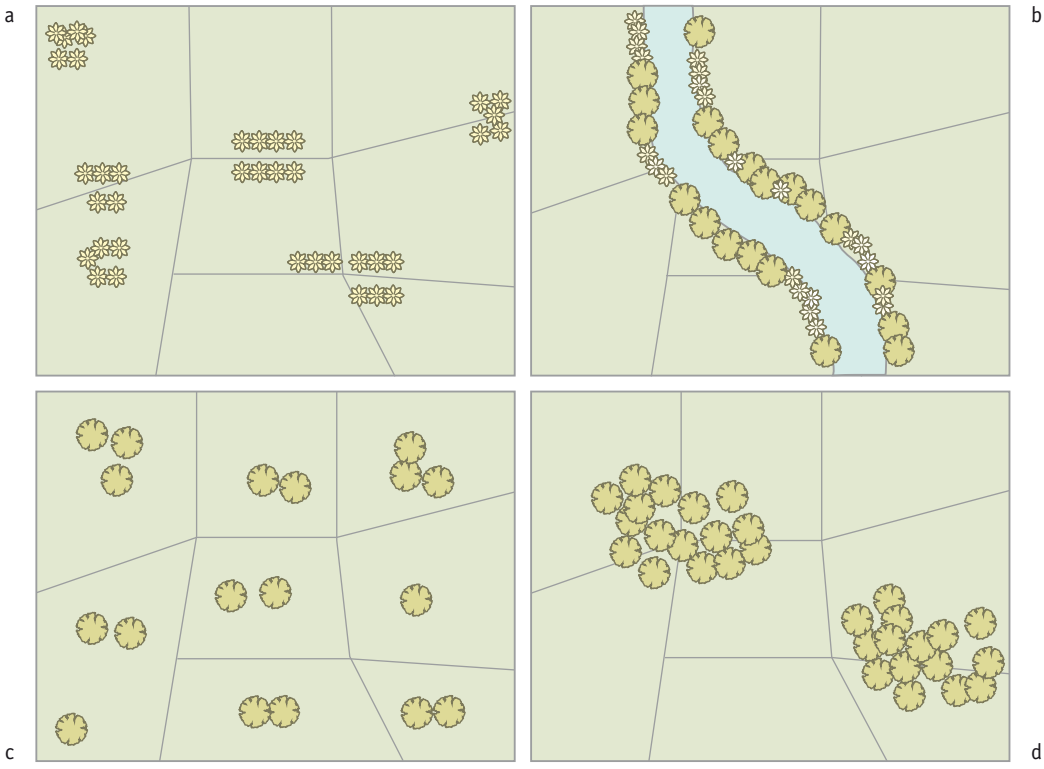
Ecosystem services, especially regulating services, such as carbon sequestration, regulation of water flow, flood protection, erosion and sedimentation control, pollination, breakdown of excess nutrients, creation of habitat connectivity critical for the survival of many large terrestrial animal species and water purification, among others, are provided at a landscape scale, thereby requiring landscape-scale management. Such management can help ensure the resilience of agricultural systems now and into the future, while also conferring other benefits to people. It also requires cross-boundary cooperation amongst landowners and managers to be successful.

Current incentives to influence land management are often focused on incentivising conservation and agronomic practices at a parcel-scale, providing only marginal value in ecosystem services production. Using three ecosystem service examples — pollination (small-scale operation), water purification (medium-scale operation) and carbon sequestration (large-scale operation) — the importance of landscape composition and configuration for sustainable agriculture are demonstrated and possible incentives to achieve these configurations are suggested.

Configuration (placement) and composition (type) of native vegetation on agricultural landscapes are critical for service provision. Native pollinators can provide resilient pollination services of great value (in Costa Rica, native pollinators were valued at USD 60 000/year for coffee; see Ricketts *et al.*, 2004) best generated through landscape mosaics of cropland mixed with patches of native habitat and floral resources that are relatively close together (100-1 000 metres), mosaics which reflect the foraging activity and range of pollinators (Ricketts *et al.*, 2004; Brosi *et al.*, 2007). Agricultural landscapes can also support water purification and flood reduction services (among other water services) through a variety of management practices.

Figure 37

Importance of configuration (placement) of native vegetation on agricultural landscapes for service provision



In each quadrant, trees and flowers represent conserved area. Light green is intensive agriculture and the grey lines delineate property boundaries. In (b), the light blue curve is a river. Each quadrant also represents a possible landscape composition and configuration that could promote certain services: (a) would promote local services, such as pollination, given the floral resources; (b) is appropriate for regional services, such as water purification and flood mitigation; (c) represents a landscape in which the critical mass of a particular composition (trees), rather than configuration, is important, i.e. a certain number of landowners must participate; and (d) is an example where the critical mass matters less, but landscape configuration is important and composition remains critical. Trees must be clustered together to form a large forest patch. Either (c) or (d) would be appropriate for global services, such as carbon sequestration, while (d) would be preferable for long-term ecosystem service provision.

Adapted from original drawing by Rebecca Goldman (IDB)

Previous page (from left to right):

↖ In many rural communities, harvesting is labour intensive and relies on cooperation.

↖ A landscape approach is essential for the preservation of many regulating services of agro-ecosystems.

Current pages (from left to right):

→ Social networks, sharing assets and capacity building are essential for good community programmes.

→ Successful PES schemes in diverse landscapes need cooperation among landholders.

→ Community cooperation for the conservation of a riparian buffer is essential for the provision and preservation of water services.

For example, by managing riparian buffers and/or wetlands, agricultural run-off can be filtered of chemicals and sediments and can be reduced in speed and quantity before entering adjacent waterways. Such buffering requires precision in landscape configuration as the buffers need to line the waterways and only continuous buffers along the length of the river and/or stream will have a significant impact. There is, however, flexibility in composition as a variety of plants and/or wetlands and management practices can help stabilise soils and slow runoff. Finally, agricultural landscapes can provide global services in the form of above-ground (and below-ground) carbon sequestration. Planting or maintaining tree cover can further provide such climate stabilisation services. In the short term, there is complete flexibility in the placement of trees. However, in the long term, wind and other stresses can lead to the recession of fragments (Cochrane and Laurance, 2002), emphasizing the benefit of consolidation of tree patches into larger areas to maintain service values. Such consolidation can yield multiple benefits, including potential wildlife corridors which require particular widths and lengths to be effective. Therefore, if landscapes are managed with future carbon sequestration services in mind, various conservation benefits can then arise. As illustrated, in terms of the production of the three scales of services on agricultural landscapes, there are mixed considerations for configuration and composition (see Figure 37) of native vegetation.

Financial incentives can promote these landscape mosaics by providing local on-farm benefits (e.g. soil stabilisation, nutrient cycling and pollination) and broader benefits (e.g. clean water, carbon sequestration and flood mitigation). For example, providing a bonus for cross-boundary conservation and thereby encouraging landowners and managers to work together can create many of the landscape configurations described previously. If a landowner was planning to grow a riparian buffer through a cost-share programme, for example, but he/she could receive a much higher percentage of the cost share or perhaps the full cost for the buffer if he/she got a neighbour to sign up as well, then this would encourage the creation of riparian buffers across the landscape, rather than just on one parcel.

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Other types of incentives could induce similar cooperation. For example, if an incentive programme were to reward cooperative behaviour through a competitive application process, groups of landowners would have an incentive to creatively maximise service benefits from cooperative behaviour in order to raise the quality of their proposed management. Incentives could then be awarded to groups based on quality and maximised benefits to ecosystem service provision. Another approach could be to create rewards for groups of landowners and/or managers who organise around ecosystem service districts combining regulatory and incentive-based approaches. While there are few examples of this type of landscape vision in policies to support management of agricultural landscapes, rapidly proliferating PES programmes and ever-developing government incentive programmes provide a foundation for and examples of how these incentives can become more commonplace.

Providing incentives to neighbouring farmers to enrol in PES schemes can increase cooperation and future mutual-aid relationships.
From left to right:

→ Sharing and exchanging resources is an important way to overcome smallholder constraints.

→ Afforestation and carbon sequestration projects benefit farmers, communities and global society.

→ Beekeeping often involves cooperation among farmers to preserve a mosaic of foraging and nesting patches.

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PES FOR IMPROVED ECOSYSTEM WATER SERVICES IN HEREDIA TOWN, COSTA RICA

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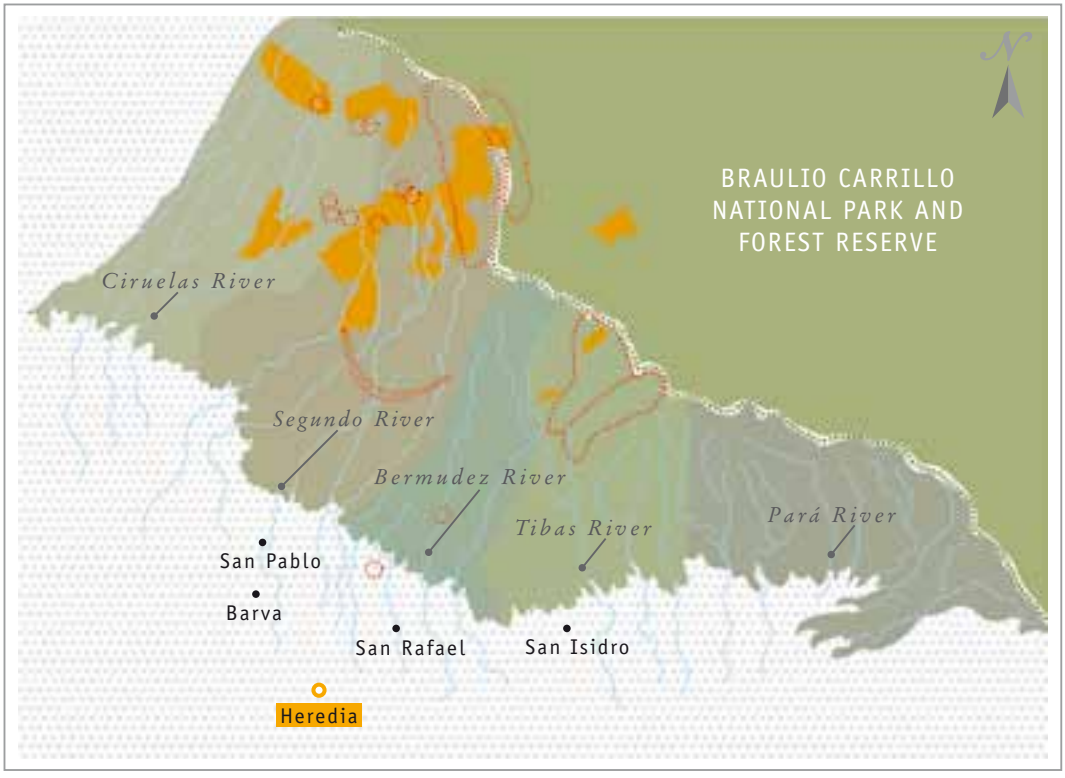
A pioneering, financially self-sufficient PES scheme was promoted in Costa Rica by the Public Utilities Company of Heredia (ESPH) to protect the water supply of the city of Heredia and surroundings (population about 200 000 inhabitants).

Unplanned urban growth and the loss of adequate forest cover in five key watersheds (Río Bermudez, Río Ciruelas, Río Para, Río Segundo and Rio Tíbas) within the Heredia catchment area risked to hamper ecological functioning, such as the filtration and recharge of groundwater (Figure 38). Deforestation was mainly linked to the conversion of forests to abandoned grasslands and dairy activities in the upper watershed areas. Since the year 2000, the Public Utilities Company of Heredia (ESPH) endorsed an adjustment to the water tariff introducing a fee to make water-users contribute directly to the cost of forest protection. A socio-economic study amongst the citizens of Heredia revealed that 90 percent of the interviewed customers supported the idea and were willing to pay up to 10-12 Costa Rican colones/m^3/month. A green fee of less than 10 Costa Rican colones (equivalent to USD 0.20) per m^3 of water used has been charged since 2000 in the monthly water bill to all categories of end-users, including residential, commercial, social, industrial and public institutions. The fee represents only 1-2 percent of the monthly water bill and has a very low impact even on poor family incomes. The financial resources coming from the water fee was used to compensate private landowners for the lost opportunity cost of converting forests on their lands. The amount paid annually for forest protection is USD 120/ha for ten years, while the reward for reforestation activities is USD 1 200/ha for five years. In addition, a direct, economic incentive equal to about USD 10 000 was paid from 2000-2002 for the conservation of forests managed by the Braulio Carrillo National Park, bordering on the study area.

Figure 38

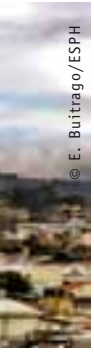
Location of a key area for the protection of watershed services to the town of Heredia and neighbouring settlements, together with the locations of sites where PES schemes have already been implemented



LEGEND

- Areas involved in PES schemes
- Key areas for watershed protection
- Ciruelas watershed
- Segundo watershed
- Bermúdez watershed
- Tibás watershed
- Pará watershed
- Limits of Braulio Carrillo National Park and Forest ReserveSegundo watershed

Adapted from original map by Esteban Ocampo (Instituto Nacional de Biodiversidad – INBio)



Current pages (from left to right):

→ Panoramic view of Heredia, also known as the "town of flowers", surrounded by mountains and a river network flowing from five different watersheds.

→ Since 2000, a water tariff has made users contribute directly to the cost of forest protection in the upper part of the watersheds providing water to the town.

In 2009, some 35 private landowners voluntarily entered into this PES programme covering an overall area of 1 190 ha, of which the 90 percent is aimed at forest protection and 10 percent at reforestation. The reward scheme for watershed services initiated by ESPH was so successful that it attracted the attention of the private sector: the Florida Ice & Farm, a soft drinks and bottled water corporation, funded 55 percent of the payments made to private landowners between 2002 and 2008 to preserve 311 ha of forest along the upper section of the Río Segundo watershed. However, in 2009, when new legislation increased the rates of water concession paid annually by the Florida Ice & Farm, the company withdrew from the voluntary payment scheme.

The PES implementation in Heredia gives an example on how is possible to set self-sufficient PES schemes on the 'user pays' principle and how such initiatives are potentially compatible with public-private partnerships. However, jointly-funded PES schemes, being voluntary agreements, require a fine-tuned level of legal harmonisation and strategic policies that support the involvement of the private sector.

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PES AND MULTI-STRATA COFFEE GARDENS IN SUMBERJAYA, INDONESIA

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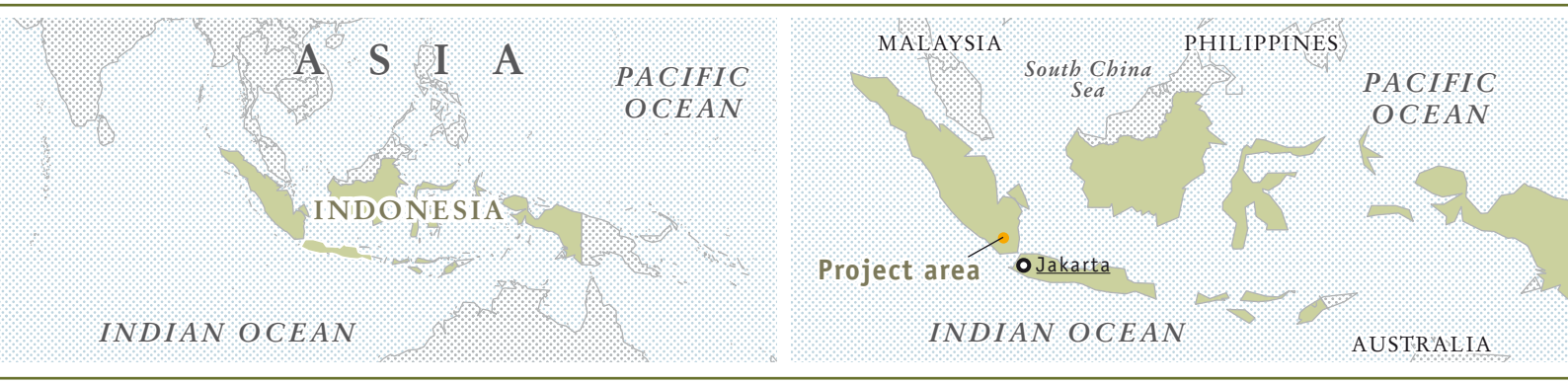


Sumberjaya is a sub-district (542 km^2), in the district of West Lampung, which has historically been the dramatic scene of massive deforestation escalating in social conflicts and poor households. Since the 1970s, Sumberjaya recorded a rapid expansion in smallholder coffee cultivation. Although the government was aware of the consequent high uncontrolled deforestation rate, it was only in 1990, when a hydropower plant was planned in the upper watershed of the Way Besai River, that it took action, concerned about slope erosion and potentially high sediment discharge to the hydropower plant (USAID, 2007). Thus, 40 percent of the land in Sumberjaya was declared as areas of restricted use and forest protection and, between 1991 and 1996, thousands of farmers were evicted from their lands. In 1998, a reconciliatory negotiation promoted by the World Agroforestry Centre (ICRAF), the local NGO Watala, the Ford Foundation and the UK Government's Department for International Development (DFID) was initiated to resolve the huge social conflict and promote sound land-use management.

In 2000, as the farmer eviction was ultimately seen as ineffective, a legal decree established a community forestry programme, called *Hutan Kamasyarakatan* (HKm). The programme, equivalent to a public-led PES scheme, allowed groups of farmers jointly applying as a community to obtain legal permission to use the state-owned land. The permission was issued for a trial period of five years with the possibility of extension for a further 25 years. In return, the farmer community commits to protect native forest trees and convert coffee monocultures into multi-strata coffee gardens (Figure 39). In these coffee gardens, coffee is grown together with some vegetables and medicinal plants under the shade of *Erythrina lithosperma*, *Leucaena glauca*, *Albizzia falcata* and various types of fruit trees.

When a contract is signed an inventory of the existing trees on the contracted land is made and the composition of the agroforestry plots to be maintained is set. In addition, the community agrees to protect the natural forest from logging and forest fires, to adopt soil conservation practices and to plant additional trees — seedlings can be obtained from the local forestry office. Performance is evaluated on the overall land, thus, the whole subscribing community is responsible for compliance of PES requirements.

ESTABLISHMENT OF A PES SCHEME

The IFAD-funded RUPES (Rewarding Upland Poor for Environmental Services) initiative has been acting as a facilitating intermediary began in 2004 and this has helped to scale up the success of the *Hutan Kamasyarakatan* initiative. To date nearly 6 500 farmers have received conditional land tenure; this has doubled the local land value, reduced corruption, decreased bribing and consequently increased household income by about 30 percent. Above all, land tenure has motivated farmers to protect the remnants of native forests.

RUPES has also being involved in facilitating a privately-funded PES scheme by launching a pilot study, RiverCare, between the hydroelectric power plant set on the Way Besay River and a community of 70 households, living on 160 ha in the Way Lirikan subcatchment, which is the contributing to major sediment discharge in the Way Besay River (Figure 40). The Way Besay hydroelectric plant, operational since 2001, presently provides 60 percent of the electricity to the province of Lampung. The sediment load can be as high as 3 kg/m^3/second and this creates a reduction in turbine efficiency, damages the plant filter and increases cleaning costs. Under the RiverCare initiative the community received a full payment of USD 1 000 in the first year to cover the implementation costs of digging sediment/litter pits, dead-end trenches, drainage ditches to reduce soil erosion in their coffee plantation, check dams in some rough

Current pages (from left to right):

→ Multi-strata coffee gardens consist of different vegetation layers constituted by timber-, fruit- and shade-based systems.

→ Sediment pits improve the infiltration capacity of the soil and provide better conditions for coffee plant growth.

→ Litter pit to facilitate accumulation of the litter layer and increase of soil protection and fertility.

sections of the river of slow its flow and sediment traps on public foot path and in gullies. In the subsequent years, the community has received payments according to the percentage of sediment reduction obtained (Table 16).

Table 16
Conditional payment scheme based on the reduction percentage of the river sedimentation load

Percentage of sediment reduction	Annual payment received by the community (USD)
≥ 30	1 000
20-29	700
10-19	500
≤ 10	250

RUPES carried out an auction process in the villages of Mulya Indah and Wanasari to estimate the costs that farmers will face planting trees (a minimum of 400 trees/ha, which includes 70 percent fruit trees and 30 percent timber trees) to reduce soil erosion. Particular attention was given to ensure that farmers understood the auction mechanism. Thus, the auction was held in two sessions, one in each village. Participants bid seven consecutive times to allow them to become familiar with the auction process. The bids submitted in the last round were considered as the real auction output. During previous rounds participants developed familiarity with the process and adjusted their estimated opportunity costs on the basis of the previous bidding outcomes. Although there was an expected certain variability in the estimate of the opportunity costs given by participants, there were 19 auction winners in Mulya Indah and 15 winners in Wasanari. In both cases, the contract price per hectare of land under the PES scheme was set close to the average opportunity value estimated by the auction (Table 17).

Table 17
Results of the auction promoted by RUPES/IFAD to estimate opportunity costs of farmers planting trees to reduce soil erosion

		Mulya Indah	Wanasari
Number of participants		48	34
Number of auction winners		19	15
Contract price per hectare of land (USD)		178	167
Opportunity costs estimated by the participants (USD)	Minimum	100	67
	Average	311	269
	Maximum	2 778	778

Recently, the RUPES RiverCare pilot project has been extended to 25 households in Buluh Kapur village. In this case, the first year payment was conditional on a 30 percent sediment reduction. Although the community did not meet this threshold, only being able to reach a 20 percent reduction, the Way Besay hydroelectric power plant delivered the first year's payment as a token of goodwill and effort made by the villagers (van Noordwijk and Beria, 2010).

PES implementation in the Sumberjaya region gives an example on the critical role of the intermediary in facilitating and upscaling publically- and privately-funded PES initiatives. The key task was to re-establish people's basic levels of trust in the government's policy and programmes, which had been disrupted by a history of conflicts on land use and allocation. The intermediary was subsequently able to establish dialogue and mediate between the interests of a major hydroelectric power company in Sumatra and very poor local farmer communities.

Current pages (from left to right):

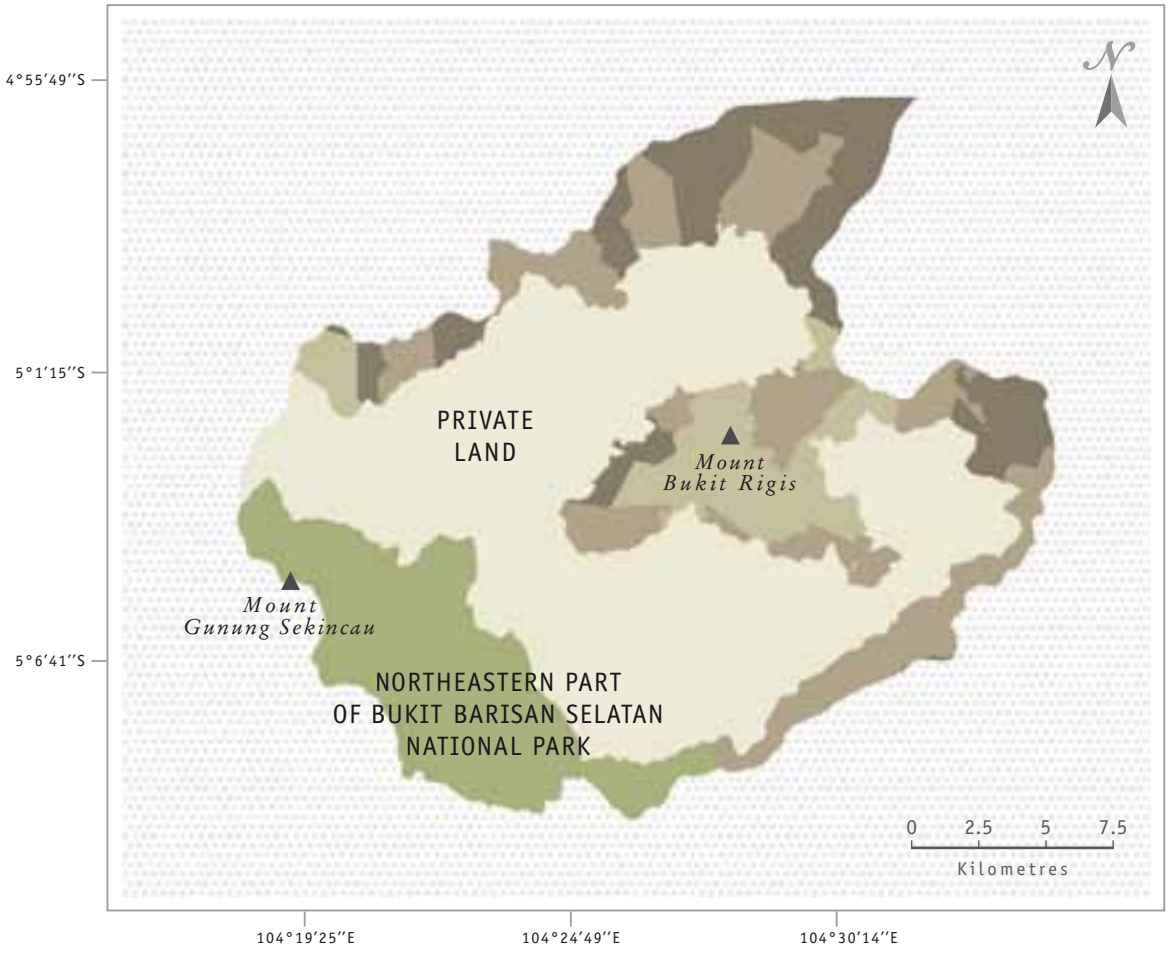
→ Agroforestry of robusta coffee (*Coffea canephora*) provides a suitable habitat for different bird species, although frugivores and specialist and endangered birds will be less represented than in natural forests.

→ Sumberjaya district produces about the 20 percent of the total coffee output of Lampung province.

→ Village settlement of Buluh Kapur near the Besai Watershed, which has been involved in RUPES activities aimed at improving the livelihoods of the poor in the Sumberjaya district.

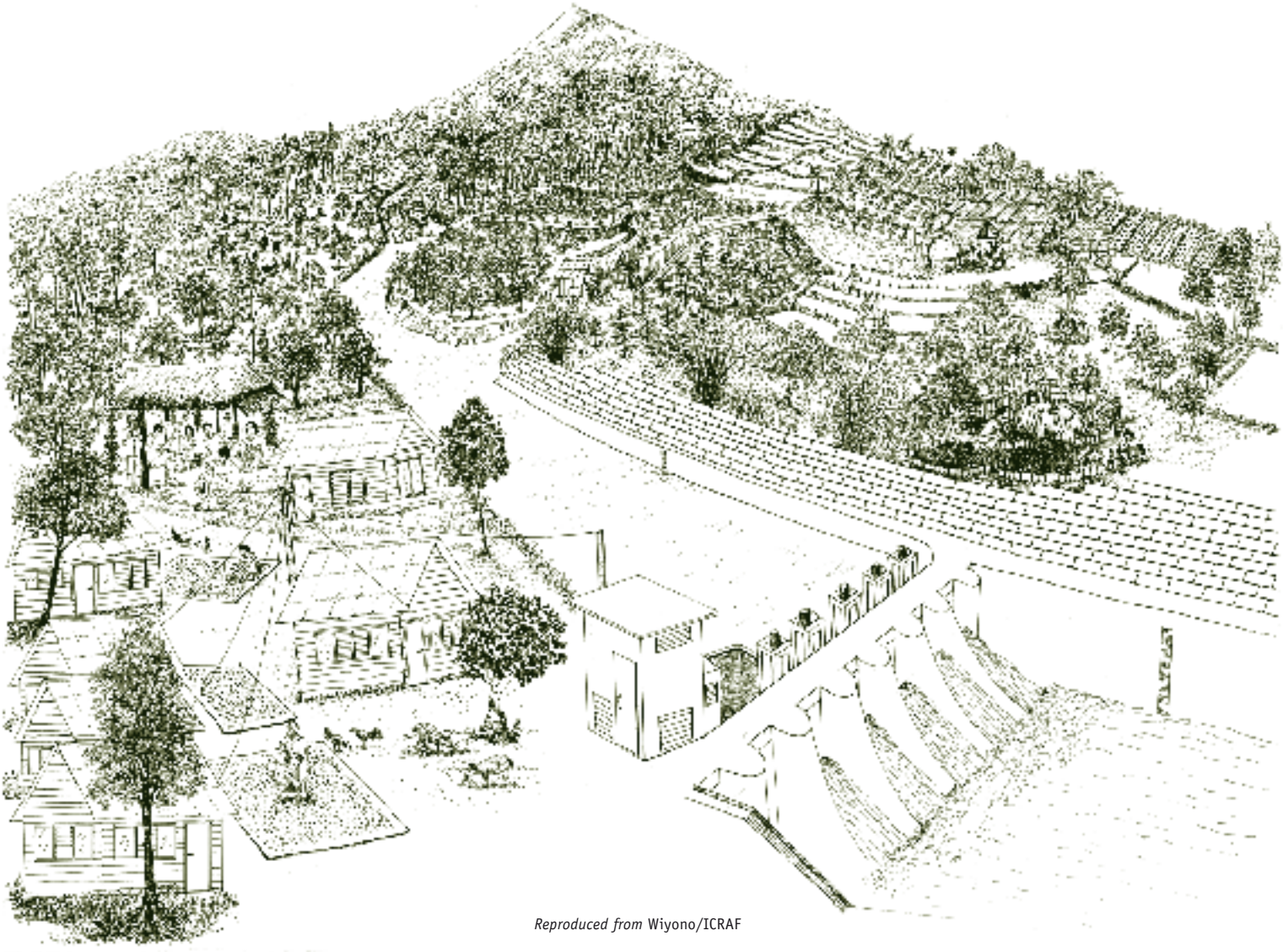
Figure 39

Occurrence of privately-owned and community-owned forests under the community-owned forest programme (HKm) in the sub-district of Sumberjaya



Adapted from original map by Andree Ekadinata (ICRAF)

Figure 40
Healthy landscape mosaics and clean water for hydro-electricity



Reproduced from Wiyono/ICRAF

Current pages (from left to right):

→ The Way Besai hydropower dam provides about 60 percent of the electricity for Lampung province, but its functioning is seriously affected by a very high sediment load coming from the upper watershed.

→ All watershed users need to work together to reduce the sediment load downstream.

→ In Sumberjaya, the community forestry programme has resulted in impressive livelihood gains, increased equity and a sense of responsibility for land care.

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Payment for Ecosystem Services (PES) is a tool used by many sectors, including the agriculture and forestry sectors, to reconcile economic activities with environmental conservation. It also is increasingly used for income generation in rural areas and, thus, offers interesting perspectives to support the transition to a green economy and sustainable development. This book reviews state-of-art information and offers new insights on the topic, highlighing key elements in PES design and identifying enabling conditions for PES implementation in different contexts. In particular, this book addresses the linkage between PES and food security. It builds on theoretical perspectives as well as lessons learned through case studies from different parts of the world. It dwells on the different economic, ecological, social and institutional dimensions of PES and suggests innovative approaches for a new generation of PES schemes for improving rural livelihoods and alleviating poverty.

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