DEVELOPING FUTURE ECOSYSTEM SERVICE PAYMENTS IN CHINA

LESSONS LEARNED FROM INTERNATIONAL EXPERIENCE

FOREST TRENDS

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A Report Prepared for the China Council for International Cooperation on Environment and Development (CCICED) Taskforce on Ecocompensation

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Forest Trends (http://www.forest-trends.org): Forest Trends is a non-profit organization that advances sustainable forestry and forestry's contribution to community livelihoods worldwide. It aims to expand the focus of forestry beyond timber and promotes markets for ecosystem services provided by forests such as watershed protection, biodiversity and carbon storage. Forest Trends analyzes strategic market and policy issues, catalyzes connections between forward-looking producers, communities and investors, and develops new financial tools to help markets work for conservation and people. It was created in 1999 by an international group of leaders from forest industry, environmental NGOs and investment institutions.

Ecoagriculture Partners (http://www.ecoagriculturepartners.org): Ecoagriculture Partners is an international NGO formed at WSSD in 2002 that promotes alliances between farming and conservation communities around the world for 'ecoagriculture'--agricultural landscapes that enhance both sustainable agricultural production and the conservation of biodiversity and ecosystem services. Ecoagriculture Partners' has programs on: Understanding and Evaluating Ecoagriculture Landscapes, Linking and Learning Among Ecoagriculture Innovators, and Policies and Markets that Support Ecoagriculture. EP works with more than 100 community, conservation, agricultural, research, private sector, public agency, inter-governmental and policy organizations around the world.

Peking University College of Environmental Sciences (http://www.environ.pku.edu.cn/English/scien.html): Research at the College of Environmental Sciences covers a wide range of environmental issues in China. Michael Bennett's collaboration with the College involves surveying and analyzing, 1) the impacts of current state forestry sector reforms on livelihoods and resource management in China's northeast state-owned forestry sector, and 2) the political economy and diversity of local implementation of China's Sloping Land Conversion Program.

ACKNOWLEDGEMENTS

Many people gave advice and analytical support to this study. We thank Andy White, Changjin Sun and Xu Jintao for their valuable inputs to the report. We are grateful to Michael Jenkins, Al Appleton, Kerry ten Kate, Carina Bracer, Daniel DiFonzo, Luke Bailey, Allison Shapiro and Ryan Booth for their support in preparing this report. We would also like to acknowledge support from the World Bank's Program on Forests (PROFOR). This study was conducted by invitation of the CCICED Taskforce on Ecocompensation as an input to the preparation of recommendations on the future direction of Payments for Ecosystem Services in China. The findings and recommendations expressed in this paper are those of the authors and do not necessarily reflect the opinions and policies of the PROFOR, its Executive Directors or the countries they represent, or of Peking University.

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PROLOGUE

This paper captures the international evolution and current status of major types of Payments for Ecosystem Services, summarizes the lessons that international experience provides regarding how best to design and implement PES schemes, and synthesizes findings especially relevant for China.

When adapting international experience to the Chinese context, a number of PES models appear most immediately applicable in China. These include a) PES between drainage-area water users and upper watershed service providers, b) biodiversity offsets to pay for the unavoidable damage of development activities, such as mining, c) improving upon current schemes, such as the Sloping Land Conversion Program and Forestry Ecosystem Compensation Fund through innovative targeting and design methods, d) carbon sequestration, both as part of existing programs and also through the development of carbon trading schemes as a means to engage the private sector.

Though these PES markets are still at various stages of development worldwide, international experience already provides many valuable insights for Chinese policymakers. In general, the key issues regarding the effectiveness and efficiency of PES programs are: the importance of policy, institutional and legal frameworks; improving the poverty reduction impacts of PES by engaging local communities in the process of negotiation, design and implementation; devising methods to improve targeting; and the need to engage the private sector in order to better capture the value of ecosystem services and to improve the financial sustainability of current and future PES programs by relieving the burden on public funds.

Around the world, policymakers and PES stakeholders highlight the fact that developing successful PES schemes is a learning process which must include platforms for dialogue. No single set of policy tools and targets will provide a definitive solution to China's environmental priorities and challenges, since these will change as its economic, institutional and scientific capacity develop. International experience also suggests that by bringing in local communities and governments more closely into all aspects and stages of PES design and implementation, China will be able to significantly improve equity and efficiency issues in current and future PES schemes. Thus, the process of building and revising PES instruments is valuable in itself, since it stimulates the ongoing dialogue, capacity-building and the institutional and legal reforms needed to better identify and align the social costs and benefits of environmental protection and ecosystem service provision. It is through this process as much as it is through the adoption of any particular set of market-based instruments that China can gain greater flexibility and adaptability in reconciling the dual goals of conservation and sustainable rural development.

Michael Jenkins, *President, Forest Trends*

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ACRONYMS

CIFOR	Center for International Forestry Research
CDM	Clean Development Mechanism (part of the Kyoto Protocol)
ES	Ecosystem Services
EU ETS	European Union Emissions Trading Scheme
FECF	Forestry Ecosystem Compensation Fund (*Senlin shengtai xiaoyi buchang jijin*)
FSC	Forest Stewardship Council
ICRAF	World Forestry Centre
IFOAM	International Federation of Organic Agriculture Movements
IIED	International Institute for Environment and Development
LULUCF	Land Use or Land Use Change Forestry
NGO	Non-governmental organization
NTFP	Non-timber Forest Product
ODA	Official Development Assistance
PES	Payments for Ecosystem Services
PROFOR	Program on Forests (World Bank)
RUPES	Rewarding Upland Poor for Ecosystem Services
SLCP	Sloping Land Conversion Program (*Tuigen huanlin huancao*)
UNCED	United Nations Conference on Environment and Development

1. INTRODUCTION

Across the world, the growing scarcity of ecosystem services has led to a flurry of conservation innovations over the past decade in the form of payment schemes and nascent markets for these services. The global economic value of ecosystem services is estimated in the trillions of dollars, though actual payments for protecting these services are developing unevenly around the globe (MA 2005). The most developed markets and payment systems are located in North America and Europe, dominated by multi-billion-dollar public agri-environmental payments and public and private conservation easements. In developing countries, several billion dollars are spent on watershed payments (ten Kate 2005). While Latin America has experimented extensively with diverse types of systems, developments in Asia and in Africa have lagged behind, although there is a large pipeline of projects ready to be initiated by international development banks and funds (Waage 2005, Booth 2005).

Against this global backdrop, the Chinese government has made extraordinary efforts in driving some of the largest public payment schemes for ecosystem services in the world. Over RMB 50 billion has already been spent on the Sloping Land Conversion Program, and 7.2 million ha of cropland enrolled. The government also spends RMB 2 billion annually on the Forest Ecosystem Compensation Fund, which currently covers 26 million ha of forest area across 11 provinces in China. Given concerns about the effectiveness and financial sustainability of these efforts, policy circles are abuzz with debate on how to improve these programs as well as how to explore and develop other market-based tools and regulatory innovations to better address China's environmental and development challenges.

To inform this growing debate, this report was produced by Forest Trends at the request of the CCICED Eco-compensation Taskforce, to summarize the global experience in payments for ecosystem services (PES) and the lessons it has provided that are of particular relevance to China. These lessons, which will be outlined in the remainder of this paper, focus on how to move from the theoretical valuation of ecosystem service benefits to the actual creation of markets with real, in-hand financial payments between users and producers of ecosystem services.

Overall, this report finds that though PES markets are still at various stages of development worldwide, international experience already provides many valuable insights for Chinese policymakers. In general, the key issues regarding the effectiveness and efficiency of PES programs concern the importance of policy, institutional and legal frameworks, improving the poverty reduction benefits of PES by engaging local

communities in the process of negotiation, design and implementation, improving methods for targeting, and the need to engage the private sector in order to better capture the value of ecosystem services and to improve the financial sustainability of current and future PES programs.

The remainder of the report is organized as follows. Section 2 first provides some background, including defining terms, universal motivations for PES, and a brief summary of China's experience to date. Section 3 then summarizes the current status, trends and potential of ecosystem service markets worldwide, categorizing these markets into Water, Biodiversity, Carbon Emissions and Offsets, and Landscape Beauty and Recreation. Section 4 summarizes the lessons that the international experience provides regarding how best to design and implement PES schemes. In particular, it discusses what current experience says about the legal and regulatory frameworks necessary for PES, who market participants, shapers and providers are, how best to design and target payment schemes to achieve environmental goals, how to mobilize potential buyers and how to incorporate poverty and equity considerations into PES design. Section 5 concludes the report.

2. BACKGROUND

2.1. DEFINING TERMS

Ecosystem Services: While there are a number of synonyms for the term "ecosystem services," such as "environmental services" and "ecological services," for clarity purposes, the term "ecosystem services" will be used throughout this report. The following table from the Millennium Ecosystem Assessment outlines the wide range of ecosystem services provided by nature, as well as their trends in the recent past.

Table 2.1: Global Status of Provisioning, Regulating and Cultural Ecosystem Services

Service	Sub-category	Status	Notes
Provisioning Services			
Food	crops	▲	substantial production increase
	livestock	▲	substantial production increase
	capture fisheries	▼	declining production due to overharvest
	aquaculture	▲	substantial production increase
	wild foods	▼	declining production
Fiber	timber	+/–	forest loss in some regions, growth in others
	cotton, hemp, silk	+/–	declining production of some fibers, growth in others
	wood fuel	▼	declining production
Genetic resources		▼	lost through extinction and crop genetic resource loss
Biochemicals, natural medicines, pharmaceuticals		▼	lost through extinction, overharvest
Fresh water		▼	unsustainable use for drinking, industry, and irrigation; amount of hydro energy unchanged, but dams increase ability to use that energy
Regulating Services			
Air quality regulation		▼	decline in ability of atmosphere to cleanse itself
Climate regulation	global	▲	net source of carbon sequestration since mid-century
	regional and local	▼	preponderance of negative impacts
Water regulation		+/–	varies depending on ecosystem change and location
Erosion regulation		▼	increased soil degradation
Water purification and waste treatment		▼	declining water quality
Disease regulation		+/–	varies depending on ecosystem change
Pest regulation		▼	natural control degraded through pesticide use
Pollination		▼*	apparent global decline in abundance of pollinators
Natural hazard regulation		▼	loss of natural buffers (wetlands, mangroves)
Cultural Services			
Spiritual and religious values		▼	rapid decline in sacred groves and species
Aesthetic values		▼	decline in quantity and quality of natural lands
Recreation and ecotourism		+/–	more areas accessible but many degraded

Source: Millennium Ecosystem Assessment 2005.

Payments for Ecosystem Services (PES): As the enthusiasm for market-based initiatives for conservation purposes grows, so, too, do the number of terms which describe these incentives. In this paper we have chosen to use the umbrella term "Payments for Ecosystem Services (PES)" to refer to the wide range of compensation made to the stewards, or providers, of ecosystem services. These payment schemes are in the process of formation around the globe, and are often at different stages of development – ranging from one-off payments between the beneficiaries and providers of ecosystem services to cap-and-trade markets. But the common defining element of PES is that **services are provided voluntarily** by the land stewards, and **compensation is contingent** on their providing the promised service.

We use 'PES' as an umbrella term to include both schemes that rely on one-off deals with rural landowners who agree to steward ecosystem services, as well as more complex 'markets' mechanisms involving offset credits traded among many buyers and sellers.

There are five basic types of buyers for ecosystem services, who respond to different motivations:

(1) philanthropic buyers, who are motivated by non-use values;
(2) public sector buyers, at different scales, who seek to secure ecosystem services that benefit the public at large;
(3) private businesses, organizations or communities who engage in private deals to secure ecosystem use-values or other business benefits;
(4) private buyers who are under regulatory obligation to offset ecological impacts; and
(5) consumers of eco-certified products, who are motivated by both use and non-use values.

The four main classes of PES systems, in terms of basic institutional structure, are:

(1) *Direct Public Payments* (such as China's Grain for Green Program) in which the government makes payments directly to rural landowners and other providers of ecosystem services. This form of PES is the most common globally. This category may include conservation easements, where landowners are compensated to set aside part or all of their land for conservation purposes.

(2) *Cap-and-Trade Schemes* (such as the European Union Emissions Trading Scheme) in which a government or regulatory body first sets a limit (a "cap" or a "floor") on the amount of ecosystem degradation or pollution permitted in a given area. Firms or individuals subject to these regulations are given the options to meet their obligations either by complying directly, or by financing other

landowners to undertake conservation activities that fully offset that damage. "Credits" reflecting such offsets may be traded and thus acquire a market price.

(3) *Direct Private Payments:* Direct private payments function much like the public payments described above, except that non-profit organizations or for-profit companies take the place of the government as the buyer of the ecosystem service in question. These payments are often referred to informally as "voluntary payments" or "voluntary markets" because the buyers engage in transactions without any regulatory incentives. Businesses and/or individual consumers may engage in non-compliant markets for reasons of philanthropy, risk management and/or in preparation for participation in a regulatory market (Hawn 2006).

(4) *Eco-Certification Programs* enable consumers to choose to pay a price premium for products produced in a way that is certified by an independent third party, according to standard criteria, to be ecologically friendly.

2.2. UNIVERSAL MOTIVATIONS FOR PES

PES systems are being encouraged and shaped by a number of global trends, including increased physical and financial demand for ecosystem services in the face of limited sources of conservation finance and enabling trends in resource governance at local, national and international levels.

Increased economic demand for ecosystem services. Increased human populations and economic activity have both reduced the effective functioning of ecosystems in producing key services and have thus increased the financial value of ecosystem services. Commercial demand for food globally is projected to double over the next few decades, and will triple or more in many low-income developing countries. Recognition by businesses and policymakers of the financial contribution that healthy ecosystems make to society, and fear of the effects of ecosystem degradation, are increasing effective economic demand for services.

Search for new sources of conservation finance. Current levels of government finance are grossly inadequate and unlikely to increase enough to conserve critical resources, due to competition for tax revenues. The finance going to conservation, as seen by various indicators, continues to decline, leading to an increased need for private sector conservation financing. For example, while UNCED and PROFOR suggest that $31-$70 billion is required annually just to meet the financial needs of sustainable forest management, funding to forestry reached an all time low in 2004. Funding to forestry represented only 0.3% of all Overseas

Development Assistance (ODA)[1] from past averages of 0.6% to 1.2% since 1990. Overall conservation financing from private philanthropy has consistently declined since 1998.[2] Additionally, only between $27 and $30 billion dollars annually are for existing protected areas (Molnar, Scherr, Khare 2003). With global economic and population growth placing unprecedented pressures on the underlying natural resource 'infrastructure,' it seems likely that many key resources will only be conserved if the costs of conservation management are adequately financed, and returns to conservation management are economically competitive with alternative resource-degrading activities.

Corporate interest in environmental investments. National and international corporations in some sectors have begun to invest in environmental assets, generally for one of three reasons: they are forced to by regulation or the pending threat of regulation in the (near) future; for philanthropic reasons, to enhance their reputation; or because payments deliver a return on their investment (Mulder et al 2006). To maintain their "license to operate" in many countries, natural resource-using businesses must demonstrate "corporate social responsibility" by reducing or cleaning up environmental damage, or demonstrating sustainable source. In recent years, some industries have recognized the "business case" for sustainable ecosystem management, in order to take advantage of new business opportunities, secure or sustain critical resource flows, enhance financial value of natural assets belonging to the company, or enabling green 'branding' of products (Mulder et al 2006). Difficulties still exist to increase private participation, but legislative securities are evolving to tend to some obstacles.

Supportive changes in resource governance. Key institutional changes at national and local levels are enabling the emergence of new contractual agreements between beneficiaries and providers of ecosystem services, including low-income communities. A key factor is modification in public governance structures at regional, national and local levels, decentralization, ownership and land tenure that enable local people to control resource management (White and Martin 2002, Molnar, Khare and Scherr 2004). At the international level, Multilateral Environmental Agreements have implications for PES, as do investments by World Bank in PES. As governments and civil society increasingly recognize the critical role of ecosystems in underpinning

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[1] OECD CRS Database figures 2005.

[2] The Foundation Center. Foundation Giving Trends: Update on Funding Priorities, 2005. These data track the donations and grants of 97% of U.S. philanthropic organizations (which accounts for 90% of the world's total). While only grants exceeding $10,000 are tracked, these represent little more than half of total estimated grant dollars awarded by US foundations

prosperity, political processes will accelerate demands on governments and businesses to protect resources. The relative balance in using different political instruments to address this goal will depend in part on political factors, including the balance of political power of beneficiaries and providers of ecosystem services. PES can in some cases de-politicize environmental policy by creating a systematic mechanism for making claims on resources and demand stewardship. For such systems to be accepted, they must be seen as legitimate, in terms of effectively protected resources for the public good and equitably allocating costs and benefits (Scherr, Milder and Bracer 2006).

2.3. EXPERIENCE OF EXISTING CHINESE PES

It could be argued that the Chinese government has been tentatively experimenting with PES programs for decades. In the early 1980s, the Ministry of Water Resources began to directly contract out fragile lands in some small watersheds to households for management, though with limited results (Liu, 2005). These initiatives have been embodied in the Water and Soil Conservation Act of the P.R.C. (1991), one of the first pieces of legislation in China passed to introduce market mechanisms into watershed management. It allows some small watersheds to be auctioned or leased to farmers or other private investors for development, with the lessee being obligated to protect against soil erosion and degradation.

More recently, the Chinese government introduced two major public PES programs. The Sloping Land Conversion Program (SLCP) was initiated in 1999 to restore natural ecosystems and diminish the negative off-site impacts – such as flooding, sedimentation of reservoirs, and dust storms – of agricultural expansion onto forestland, rangeland or marginal and/or highly sloping land. Already over RMB 50 billion has been spent on the SLCP and 7.2 million ha of cropland has been enrolled (Xu *et al.* 2006). The Forest Ecosystem Compensation Fund (FECF) was initiated in 2002 to target the management of standing forest area not owned by state forestry bureaus, and currently covers 26 million ha in 11 provinces. As its name suggests, the FECF aims to compensate landholders for the ecosystem services their land provides and for the land and resource use restrictions program participation entails. The government currently spends RMB 2 billion annually on the FECF, of which about 70% goes to farmers for an average payment of $9/ha. At present, policymakers are concerned about the financial sustainability of these programs, especially given the realization that targeting and implementation have been problematic and that both SLCP and FECP are not achieving the desired conservation or livelihood results (IIED 2005; Xu *et al.* 2002; Xu *et al.* 2006; White *et al.* 2005).

Though not well documented, numerous local and regional experiments also appear to be taking place throughout China, with varying degrees of success. Some better-known instances include, a) a water rights trading scheme between Yiwu and Dongyang cities in Zhejiang Province, b) the evolving framework of integrated watershed management and payments being developed between Beijing, Tianjin and local governments in the upper watershed of the Miyun reservoir, c) the experimental emissions-trading scheme conducted jointly with the Environmental Defense Fund and taking place in four provinces and three cities, and d) a private initiative aimed at combating desertification in Arlarshan, Inner Mongolia, run by the Society Entrepreneur Ecology (SEE), an ecological organization operated privately by a group of Chinese business people (Zhou 2005). These examples of local and regional initiatives suggest that significant interest and potential exist for PES in China.

3. STATUS OF ECOSYSTEM SERVICE PAYMENTS

Any evaluation of how to move forward with market-based initiatives for conservation must begin with a snapshot of the status and potential of these PES around the world. Globally, ecosystem services payments are at various stages of development, and some are by nature more fragmented than others. These ecosystem service payments are part of a continuum that runs from, at one extreme, large and liquid markets related to specific ecosystem services, all the way to smaller, more discrete transactions and one-off payments for ecosystem services. What all ecosystem services payments have in common is that they are mechanisms for putting a real economic value on the services we obtain from nature.

At this early stage of ecosystem service recognition, however, conditional contracts for the provision of these services have only been widely developed in the areas of water flow/quantity, flood and disaster prevention or mitigation, protection of water quality, biodiversity, carbon sequestration and storage, and landscape beauty and recreation. This is because these services are easier to monitor and have clearer financial benefits as compared to some other, more discrete, services. Thus, this section looks at the current status of each of these four key ecosystem services areas, as well as their market potential and growth trends.

3.1. PAYMENTS FOR WATERSHED SERVICES (QUALITY, FLOW AND FLOOD MANAGEMENT)

3.1.1. Current Status of Watershed Service Payments

Payments for watershed protection services can be grouped into several categories including water quality, water quantity, and flood control. These three categories of services, while linked, often have different beneficiaries and are furthered by different land use practices; thus, they are commonly the focus of separate markets. Public payments for all three categories of watershed services, as well as private payments for water quality and water quantity, have the potential to evolve into significant areas for pro-poor PES.

In contrast with carbon sequestration and many biodiversity conservation services—which benefit the global community—watershed protection services are typically primarily of interest to local and regional users (Landell-Mills & Porras 2002). In fact, a 2002 International Institute for Environment and Development (IIED) study found that 68% of watershed case studies involved local markets and 11% involved national markets (Landell-Mills & Porras 2002). It is important to note, however, that even though water markets are geographically site-specific, the scale of these markets and payments can be huge. Consider, for example, the

scale of water payments on the Yellow River as part of the Sloping Land Conversion Program in China, or the New York program to protect its drinking water by protecting its watershed (spanning nearly 2,000 square miles, 19 reservoirs and aqueducts to provide 1.2 billion gallons of drinking water daily – at a cost of US $1.5 billion or 10% of the cost of building and maintaining new filtration systems).

The fact that most watershed programs involve localized markets is both an asset and a liability for developing watershed PES. On the positive side, it is relatively easy to identify the users or beneficiaries of watershed services: municipal water suppliers, hydroelectric facilities, industrial users, and irrigation systems, since they have a defined and direct interest in maintaining water flow and quality. Furthermore, the critical day-to-day use value of these services for the beneficiaries may make revenue streams less subject to market fluctuations than PES mechanisms driven by philanthropy, public relations, or long-term global environmental wellbeing. Understanding the critical nature of watershed services for human subsistence, agriculture, and industry has helped drive the development of public watershed payment schemes, which currently represent by far the largest market for watershed services, more than at up to $2 billion annually, worldwide (Ecosystem Marketplace Matrix 2006). Monetarily, these payments are concentrated in the United States and China, but numerous smaller public watershed PES programs are being established in Latin America, Africa, and Asia (Katoomba Group 2006). One barrier to this conservation approach, however, is that many governments have serious revenue shortfalls caused by ineffective tax systems or depressed economies. Burgeoning social welfare demands compete with public sector investments in protected areas and natural resources management; the latter have actually declined in many countries during the past decade. A related problem is that using general revenues may not be equitable since some people and businesses use much more water than others do.

Table 3.1: Estimated Value of Watershed Conservation Payments

Ecosystem Payment Type	Estimated Current Value of Payments ($ per annum)	
	Globally	**Developing Countries**
Regulatory-Driven Ecosystem Offsets (including US Wetland Mitigation Banking)	$1,000 million total (including in-lieu fee etc.) $200 million (just private, for profit wetland and stream);	Unknown Many ecosystem offsets may driven by EIA regulation in developing countries
Water Quality Trading (Nutrient/Salinity trading)	$7 million	Estimated $2 million
Public Payments[3] for Water-Related Ecosystem Services	$1,000 million Example: New York City ~$150 million, WRP $240 million, EQUIP estimate 50% for water-related ~$500 million	Unknown Examples: Mexico program: $15 million; Costa Rica program: $5 million; China program: $1+ billion; Costa Rica ~30% private funds by electric, also Ecuador, public utility revenues
Private Watershed Management PES	$5 million	Unknown
Water Trading		
Water Trading	$2,000 million overall (with $100 million for environment)	Unknown Examples in Chile, Mexico

Source: Ecosystem Marketplace Matrix 2006

Compared to public payment schemes, private non-compliant watershed PES consist mainly of small, localized markets providing probably less than $10 million worth of value annually in the developing world (Ecosystem Marketplace Matrix 2006). One challenge hindering the development of these markets is the

[3] Public payments schemes may include some private payments under government mediated programs.

difficulty of translating user benefit and 'theoretical' willingness to pay into actual revenue streams. Even when private users recognize the value they derive from watershed services, they may be unwilling to pay for these services unless they perceive a threat to continued service delivery that is both immediate and likely to be mitigated as a result of their payment. Since land stewards are rarely able to exclude beneficiaries from using the watershed services that flow from their land, private users have a strong incentive to become 'free riders' and land stewards have little leverage to command payments. However, given the extensive reliance of private agricultural and industrial water users on watershed services, private non-compliant PES markets have the potential to proliferate if land stewards and buyers can overcome these challenges through collective action. Current efforts are underway to do exactly this (e.g., Bond 2005).

Cap-and-trade (compliance) markets for watershed services, driven by government regulation, are currently operating in only a few countries and amount to only a few million dollars annually (Ecosystem Marketplace Matrix 2006). Most of these markets are in developed countries, notably the United States and Australia. This situation reflects the generally weaker state of environmental regulation in developing countries as well as the significant administrative, legal, and enforcement infrastructure needed to develop cap-and-trade based markets. Going forward, there is substantial potential for new and expanded cap-and-trade watershed service markets, principally for water quality, but these are likely to concentrate in developed countries for the same reasons they have historically done so.

3.1.2. Market Potential for Watershed Services

The future scope for using financial incentives to encourage the conservation of watersheds – particularly in developing countries - is potentially huge for at least three reasons. First, the global demand for clean water is immense. Global population tripled in the last 100 years, but water use increased six times. Most population estimates project global population will grow by 2 billion over next 30 years and another 1 billion in the subsequent 20 years – and virtually all of this growth will take place in developing countries. These trends suggest that water demand will either double or triple current use over the next 50 years. In India, for example, urban and industrial use is projected to increase 135 percent over next 40 years (Dudley and Stolton 2003).

Second, the majority of the world's population lives downstream of watersheds, making them all susceptible to the costs of watershed degradation. Already, some 40 percent of the world's largest cities rely on protected areas and multiple use forests for their drinking water (Dudley and Stolton 2003).

And third, investments in sustainable watershed management are often substantially cheaper than investments in new water supply and treatment facilities. By investing approximately $1 billion in land protection and conservation practices, New York City has avoided spending $4-6 billion on filtration and treatment plants (Echavarria and Lochman 1999). Other cities in the United States - Portland, Oregon; Portland, Maine; and Seattle, Washington - have found that every $1 invested in watershed protection can save anywhere from $7.50 to nearly $200 in costs for new filtration and water treatment facilities (Trust for Public Lands 1997). In South Africa removing thirsty alien tree species in Cape Town's watershed and restoring native vegetation produces water at a fraction of the cost of water delivered through diversion or reservoir projects (Gelderblom and van Wilgen 2000).

The Ecosystem Marketplace[4] estimates that public payments for water-related ecosystem services top $2 billion USD globally, and continue to grow at an annual rate of 10%. On the private side, water quality trading is estimated to grow to $200 million and private watershed management payments are expected to top $50 million over the next decade.

[4] The Katoomba Group's Ecosystem Marketplace is an internet-based information clearinghouse that consolidates information on new ecosystem markets into a single platform. It is the first global information service to report on developments in these new ecosystem service-based markets, and the first marketplace facilitating conservation transactions between buyers and sellers of these services (www.ecosystemmarketplace.com)

3.2 PAYMENTS FOR BIODIVERSITY SERVICES

3.2.1. Current Status of Biodiversity Payments

Many approaches are emerging to remunerate financially the owners and managers of forest resources for their good stewardship of biodiversity (Table 3.2.).

Table 3.2: Types of Payments for Biodiversity Protection

Purchase of High-Value Habitat
▪ Private land acquisition (purchase by private buyers or NGOs explicitly for biodiversity conservation) ▪ Public land acquisition (purchase by government agency explicitly for biodiversity conservation)
Payment for Access to Species or Habitat
▪ Bioprospecting rights (rights to collect, test and use genetic material from a designated area) ▪ Research permits (right to collect specimens, take measurements in area) ▪ Hunting, fishing or gathering permits for wild species ▪ Ecotourism use (rights to enter area, observe wildlife, camp or hike)
Payment for Biodiversity-Conserving Management
▪ Conservation easements (owner paid to use and manage defined piece of land only for conservation purposes; restrictions are usually in perpetuity and transferable upon sale of the land) ▪ Conservation land lease (owner paid to use and manage defined piece of land for conservation purposes, for defined period of time) ▪ Conservation concession (public forest agency is paid to maintain a defined area under conservation uses only; comparable to a forest logging concession) ▪ Community concession in public protected areas (individuals or communities are allocated use rights to a defined area of forest or grassland, in return for commitment to protect the area from practices that harm biodiversity) ▪ Management contracts for habitat or species conservation on private farms, forests, grazing lands (contract that details biodiversity management activities, and payments linked to the achievement of specified objectives)
Tradable Rights under Cap & Trade Regulations
▪ Tradable wetland mitigation credits (credits from wetland conservation or restoration that can be used to offset obligations of developers to maintain a minimum area of natural wetlands in a defined region) ▪ Tradable development rights (rights allocated to develop only a limited total area of natural habitat within a defined region) ▪ Tradable biodiversity credits (credits representing areas of biodiversity protection or enhancement, that can be purchased by developers to ensure they meet a minimum standard of biodiversity protection)
Support Biodiversity-Conserving Businesses
▪ Business shares in enterprises that manage for biodiversity conservation ▪ Biodiversity-friendly products (eco-labelling)

Source: Scherr, White and Khare 2004

A 2002 IIED study of forest biodiversity protection services in 33 countries found that the main buyers of biodiversity services (in declining order of prevalence) were private corporations, international NGOs and research institutes, donors, governments and private individuals (IIED 2002). Of these, 73 percent were international, and the rest were distributed among regional, national and local buyers (Landell-Mills and Porras 2002). International and many national actors demanding biodiversity protection services tend to focus on the most biodiverse habitats (in terms of species numbers), or those perceived to be under the greatest threat globally (high number of endemic species where habitat area has greatly declined) (Chomitz et al. 1999, Rice et al. 2001).

Table 3.3: Estimated Size of Selected Ecosystem Services Payments

Ecosystem Payment Types	Estimated Current Size of Payments Globally ($ per annum)	Estimated Current Size of Payments in Developing Countries ($ per annum)
Regulatory-Driven Species Offsets (including US Conservation Banking)	Total unknown Examples: $45 million in the US; Program just begun in Australia and possibly similar program in France	Unknown Many species offsets are driven by EIA regulation in developing countries
Land Trusts, Conservation Easements (and expenditures by NGOs for conservation)	Total unknown $6,000 million in US alone	Unknown, but McKinsey-WRI-TNC estimate.roughly $2 Billion/yr
Voluntary Biodiversity Offsets (offsets outside the regulatory framework)	$20 million for just offsets	Estimated 50% of global market
Government Conservation Payments and Biodiversity Offsets	$3,000 million - just flora and fauna oriented programs (not including water and soil conservation)	Estimated $6.6 billion per year (out of the estimated $45 billion per year required)

Source: Ecosystem Marketplace Matrix

3.2.2. Market Potential of Biodiversity Services

The fastest-growing component of future market demand for biodiversity services from tropical forests is likely to be in eco-labeling of crop, livestock, timber and fish products for export and for urban consumers in middle-income tropical countries. The value of certified timber and NTFPs is estimated at a current value of $5 billion and is estimated by the FSC to top $15 billion in the next decade (FSC estimate, 2005 from Ecosystem Marketplace). Pressures continue to increase on major international trading and food processing companies to source from suppliers who are not degrading ecosystem services (Clay 2002). Demand for organic farm products is increasing at 20 percent per year, and the international organic movement is strengthening standards for biodiversity conservation (IFOAM 2002). Rainforest Alliance has initiated a labeling program with explicit biodiversity criteria, and is looking to assess impacts at a landscape scale[5].

Biodiversity offsets undertaken without any regulatory motivation are also a promising source of future demand, as many large companies are seeking ways to maintain their "license to operate" in environmentally sensitive areas, and offsets are of increasing interest to them. While the current value of biodiversity offsets may seem to pale in comparison at $20 million, over half of the offsets are taking place in developing countries and the annual growth rate is estimated at 25% (EM 2006).

Finally, the cost and political resistance to land acquisition are rising. Construction of biological corridors in and around production areas is an increasingly important conservation objective, while many of the most important sites for biodiversity conservation are in more densely populated areas with high opportunity costs for land. Thus we are likely to see a major shift from land acquisition to various types of direct payments for easements, land leases and management contracts. Land trusts and conservation easements, driven mainly by tax incentives and philanthropy and not by regulations, are worth $6 billion in the US alone, and are estimated to be worth $2 billion in the developing world. This area is estimated to continue to grow at the rate of 5% a year (EM 2006).

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[5] The mission of Rainforest Alliance is to protect ecosystems and the people and wildlife that depend on them by transforming land-use practices, business practices and consumer behavior (www.rainforestalliance.org).

3.3. PAYMENTS FOR CARBON SEQUESTRATION AND STORAGE

3.3.1. Current Market Demand and Prices for Carbon Credits

Public knowledge of the risks of climate change has led to pressure on governments and society to engage in activities to reduce carbon emissions. The market for landowners in developing countries operates within three mechanisms: i) carbon emissions offsets for the regulatory market, as established by the Kyoto Protocol, ii) the sale of "voluntary" (i.e. outside of any regulatory framework) carbon offsets coming from LULUCF projects and activities; and iii) eligible offset activities in emerging regulatory markets in the U.S. that are operating outside the Kyoto Protocol.

The carbon market has been met with the most energy, giving rise to a series of ancillary services such as investment funds, advisory services, insurance, and legal counsel to reduce transaction costs, demonstrating the increasingly sophisticated nature of the carbon market. The private sector dominates the market as a buyer of carbon credits, and its role is growing as supplier and intermediary. Most trades are internationally brokered (Scherr, White and Khare 2004).

Under the two largest and most well known carbon cap-and-trade schemes – the European Emissions Trading Scheme (EU-ETS) and Kyoto Clean Development Mechanism –362 million tons of CO2 and 400 million tons of CO2, respectively, were traded in 2005. According to Point Carbon, this was a 700 mt increase in volume over 2004 and amounted to a combined worth of $9.4 billion (Point Carbon 2006). Given these staggering figures, transactions outside of any regulatory framework have sprung up around the globe.

Private payments which are not motivated by regulation (often referred to as "voluntary payments" or "voluntary markets") are still small in scale at 2-10mt traded last year. However, these have tremendous potential in developing countries, where meeting CDM requirements tends to be a tedious and costly task. The average price of carbon per ton – ranging from $1 -$38 – is often higher in the "voluntary" market, leading to greater returns for sellers. The average deal in the World Bank's Biocarbon Fund was $3.88/tCO2 ($14.23t/C) between 1996 and 2002 (Prototype Carbon Fund 2003, Biocarbon Fund 2003). In addition, forestry carbon makes up a much larger share of non-compliant carbon trading. The development of Verified Emission Reduction (VER) standards (the FSC of carbon) is lending more credibility to this nascent market, which holds tremendous potential as it becomes more aggregated and transparent.

Table 3.4: Estimated Size of Selected Ecosystem Services Payments

Ecosystem Payment Types	Estimated Current Size of Payments Globally ($ per annum)	Estimated Current Size of Payments in Developing Countries ($ per annum)
Regulatory-Driven Carbon Forestry (e.g. Kyoto, LULUCF)	$100 million	Majority of investment in developing countries
Voluntary Carbon Forestry	$15 million	Probably 80% in developing countries
Compliant Carbon Trading	$1,000 million (just for project-based reductions)	Probably close to 80% of this is in developing countries
Voluntary Carbon Trading	$60 million	Some 50% of this is spent in developing countries
Renewable Energy Trading	$155-185 million	NA

Source: Ecosystem Marketplace Matrix

3.3.2. Market Potential for the Carbon Market

The regulatory carbon market has experienced exponential growth in the past decade, and is expected to continue its explosive growth amid concerns of global warming. As global commitments to reduce and offset emissions rise in later commitment periods, and with the eventual launch of binding U.S. strategies, both cap-and-trade and non-compliant markets will experience tremendous growth, and the demand for forest carbon offsets is likely to increase significantly.

Voluntary forest carbon currently makes up a small market share (10%) at $15 million; however, 80% of this is in developing countries where it is experiencing an annual increase of 10% (Ecosystem Marketplace, 2006, State of the Voluntary Carbon Market, Draft 2006). Currently, trading in compliant forest carbon is estimated at $1,000 million. This relatively low share of the regulatory carbon market is due in part to the fact that the EU-ETS does not include Land Use or Land Use Change and Forestry (LULUCF) as a carbon offset option. Due to increasing demand for offset sources and anticipated pressure from forest-rich countries, the EU ETS is expected to allow forest carbon sinks; if they do so in the next decade, the value of regulatory-driven carbon forestry is expected to grow to $1.5 billion. In the future, LULUCF carbon could make up as much as 20-25% of the overall carbon market (a share equivalent to its role in overall emissions), but this will require regulatory changes in the international trading regimes (Ecosystem Marketplace, 2006).

3.4. LANDSCAPE BEAUTY AND RECREATION

3.4.1. Current Status of Landscape Beauty and Recreational Services

PES for recreational uses of natural areas hold significant promise for conservation and for benefiting poor land users worldwide. This category encompasses a variety of services including the conservation of wildlife for consumptive use (hunting) or non-consumptive use (viewing) and the protection of landscape beauty. Although these services often overlap with biodiversity services, the commodity being purchased by tourists is an access right to scenic beauty, not biodiversity per se. Payments to land stewards by enterprises that cater to tourists are typically negotiated on a case-by-case basis. Furthermore, in the case of national parks, payments are often not conditional: local communities are required to curtail their activities in the park, but as compensation they receive a portion of park revenues. In a review of landscape beauty payments, the most frequent market-based mechanisms used to attach value to these services were: access rights/entrance payments such as visitor fees (50%), package tourism deals (25%), and management arrangements or projects (25%) (Landell-Mills and Porras 2002).

3.4.2. Market Potential for Landscape Beauty and Recreational Services

Although payments for landscape beauty and recreational use are perhaps the oldest ecosystem service markets, in many respects they are poorly developed (Landell-Mills & Porras 2002). A major reason is that, historically, the ecotourism 'supply chain' has disfavored land stewards while allowing tour operators, concessionaires, and hospitality businesses to capture tourists' willingness to pay for recreational and aesthetic amenities. This situation has begun to change, but the continued provision of tourist and recreational environmental services in national parks for free or well below market value undermines the ability of private land stewards to demand payments.

A significant literature has documented the detrimental effects and significant opportunity costs for local communities of protected areas that deny access to resources that these communities traditionally used. This understanding—combined with growing influence of local communities in many areas—is contributing to a trend toward increased compensation and establishment of cooperative revenue-sharing agreements between park managers and local communities (Scherr, Milder and Bracer 2006).

Given the vicissitudes of the global tourism industry—driven by factors such as the state of the global economy, the price of air transport, and the perceived state of international security—markets for tourism and recreation services may prove to be the most fickle of any of the major ecosystem service markets

(Scherr, Milder and Bracer 2006). Furthermore, the demand for such services is usually based less in scientific reality than in the preferences of tourists for a particular aesthetic or recreational experience. The changeability of such preferences implies a fluidity of demand for particular tourism and recreational services. Regardless, according to the U.N. World Tourism Organization, "in absolute figures worldwide earnings on international tourism reached in 2004 a new record value of US$ 623 billion…Europe earned a bit over half of worldwide receipts (52%), the Americas 21%, Asia and the Pacific 20% and Africa and the Middle East around 3% each (World Tourism Organization 2005)." The World Trade Organization (1998) estimates that ecotourism and all nature-related forms of tourism account for approximately 20 percent of total international travel (The International Ecotourism Society 2000). Therefore, in spite of the challenges ahead, the upward trend in growth and popularity of ecotourism brightens the outlook for increased payments in this sector.

4. LESSONS LEARNED AND DESIGN INNOVATIONS FROM INTERNATIONAL EXPERIENCE

Nations seeking to sustain ecosystem services face the challenge of translating the underlying resource assets and services into streams of income and wealth that will be recognized and rewarded by other sectors of the society and economy dependent on them. Diverse approaches to PES are being tried in different places, and these experiences provide key lessons learned and design innovations that may be relevant to China. Moreover, they highlight institutional elements that must be put in place to scale up PES to have significant benefits to ecosystems and development. This section focuses particularly on lessons learned regarding policy and institutional frameworks, design of PES to achieve equity objectives, design to improve PES efficiency and effectiveness, and approaches to engage the private sector as buyers.

4.1. POLICY AND INSTITUTIONAL FRAMEWORKS

The PES systems that have been set up in the past two decades represent a fundamentally new type of economic and market transaction. While in its simplest form just a contingent contract between buyers and sellers of an ecosystem service, the maturing of such systems of contracts, the scaling up and in some cases integration of primary and secondary markets in contracts and credits will involve the same types of institutional development found in other markets. Figure 4.1 highlights the key institutional elements that international experience has shown must be in place for ecological payment schemes to succeed. Forest Trends has used this framework to develop a tool for assessing national institutional development for PES (Waage, Scherr, and Inbar 2005), which has been tested in five countries. This section focuses on the policy and institutional framework – including legal frameworks, property rights, strategic use of PES in relation to other policy instruments, and platforms for negotiating PES agreements.

4.1.1. Legal and Regulatory Frameworks

For the majority of ecosystem services that are "public goods," the creation of PES requires proactive efforts on the part of governments and non-government actors. At its 2003 meeting in Locarno, Switzerland, The Katoomba Group concluded that lack of policy frameworks was one of the two most critical overall barriers to the expansion of PES (the other was market information). Strategies to develop ecosystem service markets need to be integrated into broader resource planning frameworks, and it is the responsibility of policymakers and regulators to provide a supportive framework for PES markets. For public payments and cap-and-trade

systems, governments are directly responsible for developing the "rules of the game." While private ecosystem payment schemes and eco-certification do not rely on government to set up implementation, policies still need to establish rights to buy and sell ecosystem services, and establish safeguards needed for buyers, sellers and investors. Different legal and regulatory frameworks are required for different types of payment schemes (Scherr, White and Khare 2004).

Figure 4.1: Essential Components for Establishing Ecosystem Services Payments and Markets

Direct buyer-seller deals require adequate contract law and legal services from the government to provide contract enforcement and, ideally, clear legal guidelines as to who "owns" ecosystem services and who has the right to sell them. For example, some countries have claimed carbon rights for the state, so that private sellers cannot receive payment without government authorization. Due diligence requires that buyers ensure that sellers have legal rights to the land or forest covered by the contract. All instruments that rely on formal contracts and reliable contract enforcement require a well-functioning legal system. Mechanisms to assign

liability in case of non-performance are required. Depending upon the institutional and legal environment where they are operating, contracts may be quite simple and flexible, or detailed and binding with clauses on non-compliance. Private contracts for permanent conservation easements need to be formally recorded in public land records.

Public payment schemes require legislative authorization to allocate budgets and set administrative rules and responsibilities. Such rules define what services are to be purchased, who is eligible to be a supplier, terms of payment, performance standards and monitoring procedures, and procedures in case of breach of contract. Examples of recently established public payment schemes in tropical and sub-tropical countries include the Mexico example in Box 4.1 below, and China's Forest Ecosystem Compensation Fund and the Sloping Land Conversion Program.

Box 4.1 - ***A Fund to Finance Forest Ecosystem Services in Mexico***

In 2002, the Mexican Government created a new, US$20 million fund to pay indigenous and other communities for the forest ecosystem services produced by their land. Indigenous and other communities own approximately 80 percent of all forests in Mexico – totalling some 44 million hectares - as collectively-held private land.

Market Features and Rules: The National Forestry Commission signs a Letter of Intent (contract) with a land owner that can be renewed automatically yearly over a period of 5 years. The first payment is made within 16 working days of signing the contract and subsequent payments are made at the end of the calendar year, based upon a satellite photo and random site inspections.

The seller is required to not deforest the land, to guard it from outside sources of deforestation, to advise the buyer of any unforeseen changes to land cover in the area and to allow monitoring of the land by the Program. The contract stipulates that if the expected land management and conservation does not take place, the buyer (government program) is not required to pay the forest owner, and continued participation in the program is terminated for that contract. Further, the forest owner can not reapply for a new contract in subsequent phases of the program.

The price paid to the land owner has been determined by the government based on the opportunity cost of use of the land, assuming that earnings from corn production would be the alternative activity on the land. The price of ~$30 or ~$36 is an average of the corn productivity of land in the areas contracted. The different qualities of hydrologic benefits are derived from the relationship between forest type and water outcome expected. Thus, cloud forests/mesofilous forests receive higher payments of $400 Mexican pesos/ha (~US$36) and temperate forests receive $300 Mexican pesos/ha (~US$30).

Source: Ecosystem Marketplace 2005

To establish open trading in ***cap-and-trade markets***, governments must first establish regulations creating a market for ecosystem service credits by legally mandating (and enforcing) a group of buyers for such credits, such as carbon polluters in carbon markets or land developers in biodiversity markets. The government must then specify what types of "commodities" (for example, types of habitat in specific ecosystems) can be traded and set "the rules of the game" for trading the credits. One of the few jurisdictions to establish an extensive legal and regulatory framework for trading has been New South Wales, Australia (Box 4.2).

Philanthropic payments for ecosystem services (e.g., automobile drivers or frequent flyers offsetting their carbon emissions; conservationists payment for habitat protection), and *arrangements between neighboring communities*, may involve less stringent contract arrangements or regulatory frameworks. Some international conservation organizations have successfully set up "conservation concessions" in areas with weak legal systems, such as remote rainforests in Africa and Latin America, on the basis of informal agreements (Rice 2001). Where PES are being set up in areas where customary law is still widely used or locally respected, it is essential to ensure that the types of agreements made in the PES are also considered acceptable under customary law.

Product eco-certification schemes require little, if any, special public legal framework, although they can benefit from supportive public policies, such as exemption of certified producers from public environmental regulations and preferential treatment in public procurement. However, the rules and procedures for certification, including criteria and standards, procedures for verification, must be developed and agreed upon by private buyers, traders and NGOs. As argued by Meidinger *et al.* (2001), certification thus functions in many ways as a form of civic environmental regulation, although in some international certification programs, rule-making has been limited to a narrow range of environmental groups and western scientists.

Box 4.2 - *New South Wales, Australia, Establishes Legal Framework for Ecosystem Service Markets*

Over the past 200 years, approximately 95 million ha of forest and woodland vegetation in Australia have been cleared for pastoral grazing and agricultural cropping. As a result, Australia's forest and land use sector was a net emitter of CO_2 in 1990, the baseline year of the Kyoto Protocol. About 15- 20 percent of Australia's GHG emissions arise from the on-going clearance of forests and woodlands. Dryland salinity, caused by this deforestation, continues to threaten millions of hectares of productive farmland, and the water supply of some major cities. It is important from a socioeconomic perspective that land use changes take place in areas where marginal cropping or grazing activities are currently occurring. Changing these areas back into forestry can help to diversify regional economies and will increase the long term economic product in many areas.

Pioneering efforts have been made to support the commercialization of ecosystem services from forests to achieve these goals. In late 1998, the New South Wales (NSW) state parliament passed carbon rights legislation that allows investors to record ownership of the rights to carbon sequestration in forests on land titles. Most recently, in January of 2002, the NSW government indicated that, as part of its goal of reducing greenhouse gas emissions by 5 percent per capita from 1989- 1990 levels, it would impose a penalty of 10-20 Australian dollars per tonne of excess CO_2 emissions. The NSW government also indicated that carbon sequestration credits could be used as offsets against this commitment and released a detailed position paper on the carbon credit accounting, registry, and trading systems.

Source: Ferguson 2005

4.1.2. Property Rights

Stability, predictability, and consistency in *de jure* and *de facto* property rights, as well as transparency in the allocation of those rights, are critical factors in the use and success of market tools to protect ecosystem quality. The degree of confidence that is attached to these tools will be determined by the integrity of the legal and regulatory systems that support the allocation of rights, as well as public attitudes about fairness and equity.

Property rights relevant to PES include the following:

- Rights to the land, water, forest or other resources whose management generates the ecosystem services (e.g., the forests that are protecting drinking water quality of streams);
- Rights to secure and access the ecosystem services themselves (e.g., rights of resource owners and local and downstream non-owners to consume water of high quality);
- Rights to buy and sell ecosystem services (e.g., the right of forest owners to sell water purification services to users in adjacent communities);

- Rights to control management of resources owned by others (e.g., the right of a downstream company to buy a legal easement in the forest which restricts the rights of the owner to fell that forest);
- Rights to degrade an ecosystem service (e.g., pollution credits initially allocated to a limited group of actors in a cap-and-trade system).

Decisions about the allocation of all of these types of rights are fundamentally political and cultural. Thus PES will be politically acceptable only where all the parties agree, or at least accept and are willing to protect these rights—and have confidence in the long-term security of the arrangements (regardless, in some cases, of their technical legality). For example, actors who believe they have the right to high quality water may be unwilling to pay landowners for improving degraded water quality. In this situation, the market opportunity may be limited to a) transactions among landowners seeking the most cost-effective ways to meet their responsibilities, or b) payments by beneficiaries to landowners for measurable water quality improvements in situations where the government has not defined water quality standards, has no monitoring system in place, or lacks enforcement capacity. On the other hand, if landowners are acknowledged to have the right to pollute or are unable to shift to less polluting systems on their own, changing their behavior may require compensation from downstream users.

In many tropical countries, property rights on land and forest are far from settled, much less rights to benefit from the sale of ecosystem services. Resolving such tenure questions is an essential first step in setting up payments and markets for ecosystem services. A key part of this is determining how and to whom rights over ecosystem services, rights to manage them and rights to buy and sell them should be allocated. In the United States, rights to manage and sell ecosystem services typically lie with individual private landowners. Thus, most PES there are paid to individuals. In some parts of Latin America and Africa, on the other hand, these rights are collectively owned by indigenous or tribal groups. Elsewhere these may be claimed by governments, though with varying degrees of public acceptance.[6]

When tenure questions remain unresolved – where resource rights are informal, contested or weakly enforced – local or national elites may seek to capture the benefits from PES by claiming the resource. As a result, in some countries stewards have been reluctant to engage in PES due to fears that once the desired land use changes are undertaken, other groups or agencies will step in and rescind their rights to own the resource, to

[6] In Rajasthan, for example, communities organized to recharge groundwater in local aquifers through major land management changes, and the government eventually allowed them to begin to sell access rights to the water (Rajendar Singh, 2004).

own the ecosystem service rights, or to the payments made. Rent-seeking at the local of national level may interfere with these markets, as in one case in Africa where no project was approved by the national carbon office without a payoff to its director.

4.1.3. Strategic Role of PES in Overall Conservation and Development Strategy

A 2005 review of PES in developing countries (Forest Trends 2005) concluded that there is a need for much more strategic consideration of the use of PES, so that it complements other policy instruments. This does not mean detailed top-down planning. Rather, it involves a strategic assessment based on input from key stakeholders of existing incentives, financial resources, regulatory capacity, etc, to guide both land stewards and ecosystem service buyers towards a sensible mix of activities, and to highlight those areas where PES could be especially promising as well as where other regulatory and legal tools would be more effective. As Molnar *et al.* (2006) argues, in some cases changes in property rights of local people, or simple contracts offering social services rather than payments, can be by themselves more effective in securing flows of ecosystem services from land and resource stewards.[7]

Most PES have been initiated without such strategic considerations. While some are implemented under the umbrella of public ministries responsible for broad conservation policy, most are designed and implemented independently by particular departments, NGOs, companies or land steward associations, and are set up as stand-alone projects or programs with a specific purpose, often expressly as alternatives to regulations, technical assistance or public management deemed to be ineffective. One common adverse outcome of this is a set of PES efforts that are uncoordinated with each other and with other conservation strategies. In these cases, private sector buyers (and potential buyers) of both forest carbon offsets and biodiversity services complain that they receive little guidance about which areas are actually eligible to be carbon offset sellers, or which are agreed to have priority for biodiversity conservation.

Another adverse outcome is that PES are being sought for resources that are actually quite amenable for other conservation finance, and scarce resources for PES are being used to secure ecosystem services in less important areas. Some PES encounter serious difficulties in achieving congruence with contradictory or restrictive policies from other sectors. Thus, communities in some African countries are being offered

[7] Numerous examples have been reported unofficially of PES being used as an instrument where strengthened land rights would have been sufficient to induce the desired sustainable land management, or where enforcement of regulations would have been effective with landowners amply able to make the necessary and profitable investments in resource management (Molnar, et al. 2006)

payments for biodiversity conservation within national park areas by one public agency, while another agency continues to seek their expulsion from that area.

Given these experiences, some groups are beginning to undertake strategic assessments. The WWF-TNC-Stanford University "Natural Capital" project is working to map the flows and values of ecosystem services within priority ecoregions (including in China), so conservation can target "win-win areas" of importance to both biodiversity and human welfare. Ecoagriculture Partners is developing a methodology for assessment of market opportunities to promote ecosystem services in agricultural landscapes, which jointly assesses and compares diverse options for financing biodiversity conservation, including markets for PES with wild product markets, eco-certified product markets, market infrastructure, and non-market interventions (Ecoagriculture Partners 2006).

4.1.4. Creating Platforms for Negotiating PES Agreements

As discussed above, it is useful to consider PES fundamentally as a 'contract' between stewards of ecosystem services and those who wish to secure those services. Many public and private payment systems have begun with the buying agency unilaterally setting the terms of the contract regarding what activities will be eligible for compensation, the price, etc. International experience, however, is showing the benefits of active negotiation between buyers and sellers in developing a contract that will be sustainable and achieve outcomes. Given that most PES are for services that have at least some 'public goods' element, and that non-parties to the contract may have an interest in protecting their own access to services, a platform for negotiating ecosystem service agreements is highly desirable.

Such a platform may be provided by a neutral party, such as a government agency not directly part of the anticipated deal. The New York City watershed deal involved extensive consultation with stakeholders to develop the final terms of the program, which has been documented by Appleton (Appleton 2002). PRISMA has documented the promising potential – for use in developing PES programs – of existing platforms for "territorial planning" in some indigenous and other regions of Central America (Artiga 2002). Municipal governments have been instrumental in hosting talks between upstream watershed managers and downstream irrigators and industrial water users in the Philippines and elsewhere (Catacutan, Garrity and Duque 2001). IIED and RUPES have developed models for intermediated negotiations between community stewards and private sector buyers (Mayers and Vermeulen 2002).

PES also has the potential to change the political context for dialogue for conservation. For example, improved targeting and efficiency of PES will create a new mechanism from which winners emerge (communities, sellers, etc.) and offset the political opposition coming from companies and others who don't want to pay for these goods and are putting pressure on the government. In a number of situations where disagreements exist across jurisdictions of municipal, state, and national governments as to who has rights to manage, claim, sell, etc., ecosystem services (this is a common situation, especially with carbon offsets), PES mechanisms have in fact served as a platform to resolve these conflicts. In general, most of these issues involve changing attitudes, rules, values, scarcities and politics, and must often be worked out in public discourse before PES can be designed effectively. Also for this reason, PES needs to be designed with some element of flexibility so that basic issues can be addressed.

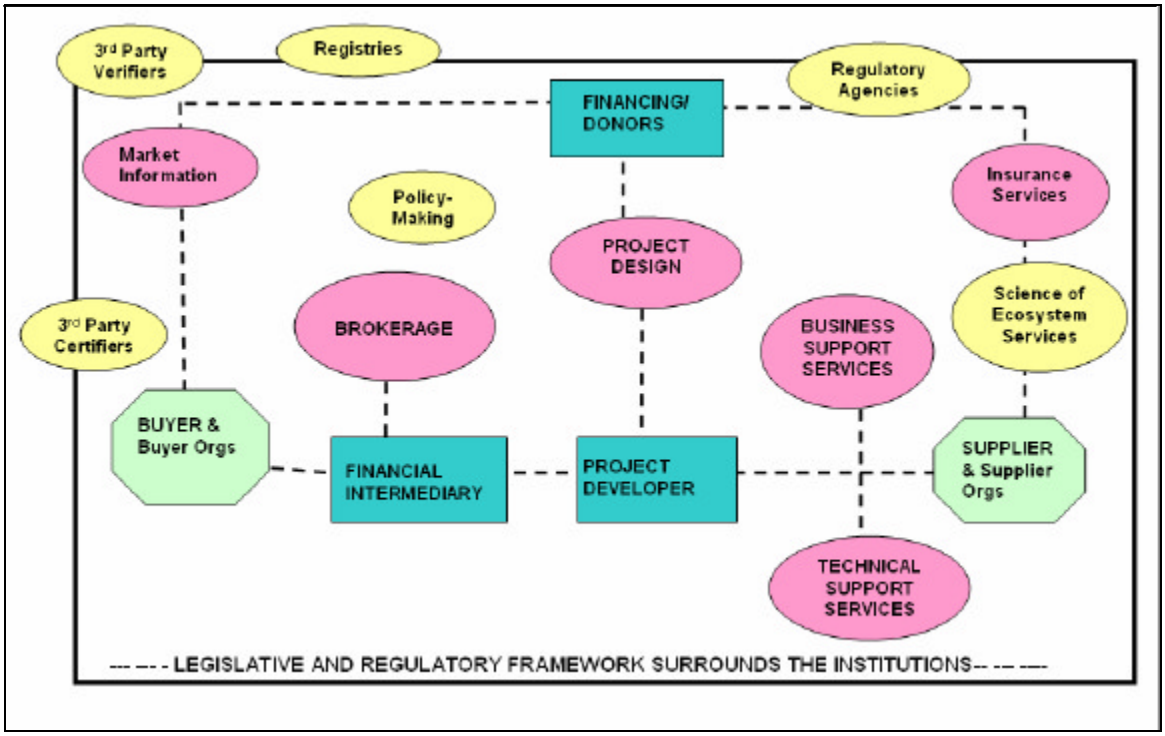
4.1.5. Institutions Required for Scaling Up PES

As with any established market, a mature system of PES involves a large number of different actors. In order to grow these ecosystem markets and to engage the private sector, the necessary stakeholders and institutions must be identified or developed if they do not exist.

As seen in Figure 4.2 below, the principal groups involved in ecosystem markets are as follows:

- Buyers (direct or indirect beneficiaries of the ecosystem service, including the private sector or the government):
- Suppliers/Sellers (land or resource owners or managers who provide stewardship services to protect or restore ecosystem functions);
- Service providers and project developers (brokers and financial intermediaries, business administrative and support services, technical services); and
- Policymakers/regulators (those who establish rights to buy or sell stewardship services, rights over the resources themselves, contract rules, and—in the case of public payments—the detailed rules of eligibility, targeting, compliance, etc.).

Figure 4.2 - Institutional Roles in PES



Source: Inbar and Scherr 2006.

The development of the 3rd category of actors – service providers, intermediaries and project developers – is a hallmark of more mature markets. While these roles may be played by government agencies or NGOs in the early phases of PES development, in later phases most should be primarily played by private sector organizations. Government roles then focus on setting the rules of public payments and regulatory framework for private PES, on ensuring public input and oversight of PES in cases where public services could be significantly affected, and financing services that would otherwise not be of interest to the private sector (such as ecological regulatory functions).

Table 4.1 - Business and Technical Support Services for Project Implementation

Table 4.1. Business and Technical Support Services for Project Implementation

Service	Description	Provider	Example
Financing (if distinct from buyer, or intermediary)	Provision of necessary capital/ operating funds to implement activities	Banks, multilateral investment banks, business firms, foundations/trust funds, NGOs	BioCarbon Fund (www.carbonfinance.org/ biocarbon)
Measurement of ecosystem services and Ecosystem Management Support	Determine value of ecosystem service and plan landscape management	NGOs, business firms	Ecolands (www.ert.net)
Monitoring (ecosystem services or activity)	Regular collection and analysis of data to ensure accountability	NGOs, business firms	Edinburgh Centre for Climate Management (www.eccm.uk.com)
Verification (ecosystem services or activity)	Process of review to ensure accuracy of information	NGOs, Business firms	Less Carbon (www.less-carbon.com)
Insurance	Protection from risk and compensation for loss	Insurance companies, banks, business firms	Swiss Re (www.swissre.com), Trexler and Associates, Inc. (www.climateservices.com)
Legal Services	Financial and legal advice	NGOs, business firms	Ecosecurities Ltd. (www.ecosecurites.com)
Technical assistance on marketing	Expertise on the state of the market and points of access	NGOs, business firms	Evolution Markets LLC (www.evomarkets.com)
Registries	Collection, configuration of information in a database	NGOs, public agencies	Environmental Resources Trust (GHG Registry) (www.ert.net)
Certification	Careful and thorough examination of service/product according to set of guidelines	NGOs, business firms	Rainforest Alliance and Smartwood (www.rainforestalliance.org), Societé Generale de Surveillance (www.sgs.nl/agro/pages/carbonoffset.asp)
Technical assistance for improved land and resource management	Expertise on designing and implementing new and improved forest management regimes	NGOs, business firms	Winrock International (www.winrock.org)

Institutional needs for developing PES schemes are site and situation specific, making it difficult to outline requirements for a particular ecosystem service or payment type. Depending on the motivations of the buyer,

specific institutional support needs – for instance, a 3rd party certifier – will vary greatly. While there is thus no standard model, stakeholders can discuss the following issues to help identify institutional needs when developing PES schemes:

- Which institutions are necessary to establish the desired threshold of buyer confidence in the viability and sustainability of the service?
- Are there existing institutions which could be adapted to fit these needs, or do new ones need to be developed?
- Should this institutional function be provided by the public sector or can the private sector play a role in this? If so, is government oversight necessary?

Given the high level of diversity in institutional arrangements, lawmakers and stakeholders should not feel bound to emulate other prominent payment schemes, but should focus closely on the needs of the situation at hand, building on existing enterprises and institutions whenever possible.

More generally speaking, scaling up PES appropriately requires overcoming barriers for all of the key stakeholders. A survey by Forest Trends found that for buyers, the most binding constraints are: lack of awareness of the role and value of ecosystem services to their business, unclear evidence of financial benefits, challenges of aggregating buyers to achieve ecosystem services at the necessary scale, lack of internal capacity to plan and manage PES, and lack of clear, publicly-endorsed mechanisms for PES.

For sellers who are medium to large-sized landowners and commercial enterprises, the principal constraints are: lack of capacity to assess real market opportunities, lack of relevant business models, lack of technical assistance, and high transaction costs. For small-scale or low-income community producers, constraints include: difficulty in gathering relevant information on PES programs, lack of capacity to influence enterprise design, difficulty in protecting their own interests in negotiation the terms of PES, and barriers that limit their participation in the process of PES policy development.

Private and public investment institutions face other key barriers. These include lack of data on financial performance, lack of understanding of these markets, high regulatory and policy risks, lack of financial intermediation services and highly uncertain prices. Business and technical support providers and project developers lack a broad understanding of market opportunities, lack of practical models for structuring deals and contracts, and lack of access to training and capacity-building opportunities that would support dynamic field operations.

Finally, policymakers and regulators face other constraints. These include political and social conflicts over the use of market-like instruments, lack of policy and regulatory models for specific ecosystem management challenges, and lack of practical guidelines and advice on policy design and implementation. Institutions are explicitly needed to provide the cross-sectoral knowledge-sharing and coordination required for successful and efficient PES. New mechanisms have arisen. The US federal government, for example, recently set up an Inter-Agency Initiative on PES, involving almost all agencies involved in land, forest and water management. The Katoomba Group, which started in 2001 as an informal international working group on PES to support innovative pilot programs, now has active working groups in Tropical America and in Eastern and Southern Africa to catalyze sharing of models, lessons learned, etc. across countries and sectors, and among buyers, sellers, intermediaries and policymakers (see www.katoombagroup.org). A new platform for PES has also recently been formed in the Northwest U.S. The Katoomba Group's Ecosystem Marketplace provides a global platform for market information-sharing, which greatly reduces investment risks and the costs of linking market actors.

4.2. DESIGNING PES TO ACHIEVE EQUITY OBJECTIVES

As a result of public tenure reforms worldwide, indigenous and other rural communities now own or control a quarter of all natural forests in tropical developing countries, and this share is projected to double by 2020 (White and Martin 2002). Agroforestry on small-scale farms and community forest plantations is also expanding rapidly and offers opportunities to promote patterns of agricultural development that also enhance ecosystem services.

Markets for ecosystem services could potentially provide financial benefits not only from the sale of ecosystem services, but also from improved human capital due to associated training and education, and strengthened social capital due to investment in local cooperative institutions. It is also critical to design ecosystem service markets so that they do not threaten the livelihoods of vulnerable groups of low-income ecosystem stewards and beneficiaries. This section reviews the potential benefits and risks of PES for farm, pastoral and forest communities, as well as the key issues that are arising around the world about targeting PES to benefit the poor, what has been learned about pro-poor design elements for PES, and how to strengthen capacity of smallholders and the poor to participate in and influence the shape of PES.

4.2.1. Potential Benefits of PES for Farm, Pastoral and Forest Communities

Local communities who rely heavily on their land, forests and other resource assets for income may welcome ecosystem service payments as part of a "portfolio" of income streams. Their livelihood and enterprise strategies will usually seek to ensure both subsistence security and sustainable income in the face of market risks and uncertainties. Establishment of agroforestry systems offers a way to enhance ecosystem services in regions of annual cropping, together with afforestation in critical areas of watersheds, and creation of biological corridors to enable wildlife movement across agricultural landscapes.

PES may sometimes be small and variable compared to household income, yet they can have significant impacts on the livelihoods of participants; they provide a form of financial stability that allows households to make sound investments in their futures, while continuing to work for their primary revenues. Some examples of this are as follows (from Orrego 2003; Rosa *et al.* 2003; Pagiola *et al.* 2003):

- The annual income of farmers participating in the Scolel Te carbon project in Chiapas, Mexico, range from $800-$3000, depending primarily on coffee and corn. Carbon payments also vary, depending on the size and land-use system of land registered into the project. Farmers generally receive $8 per ton of carbon sequestered and can collect between 13 to 2,000 tons of carbon, so that carbon payments range between $120 and $16,000 per farmer. Thus the contribution of carbon payments to total income varied greatly, but was in many cases quite significant. Such payments, furthermore, are more consistent than crop income, allowing farmers to invest in more sustainable land use systems and livelihoods.
- A survey of New York Catskill farmers, participating in the Water Agricultural Program, found that 44.3 percent of surveyed farmers maintain that watershed paym ents have enhanced their economic well-being. Almost all of the farmers surveyed in New York had other sources of income outside of farming. Watershed payments provided them additional economic benefits, such as infrastructure improvements and marketing assistance, which help to increase the net worth and efficiency of watershed farms.
- In Costa Rica, one survey of participants in PES schemes showed that for three quarters of respondents, these payments accounted for less than 10 percent of individual family income.

In general, these payments are often most attractive to producers who are already managing ecosystem services fairly well, and thus incur few additional costs. PES intended to fully protect endangered habitats (through land acquisition, permanent easements, and long-term leases) must typically pay landowners the full opportunity cost of leaving agricultural land or forests out of productive use; otherwise, they will not relinquish their rights. In remote areas, that value may be a fairly low. Elsewhere, available payments will not necessarily compensate for the full opportunity cost, nor cover the entire cost of adopting management

systems that protect ecosystem services – as many local land users in China have experienced under the FECF. Moreover, given poorly developed market institutions, transaction costs can be very high, so that forest producers will typically receive payments that are much less than the original buyer pays for the service (see next section).

Because ecosystem service beneficiaries are more often willing to pay for services where these are serious degraded, PES are, at present, more commonly used for ecosystem restoration than for conservation of standing forest. The effective demand for ecosystem services tends to be greater in areas of higher population density where a higher share of the natural forest has been converted to other uses, and where the scarcity factor has increased the financial value of ecosystem services. The current structure of the carbon market focuses only on tropical afforestation and reforestation, although there are some new interesting developments around avoided deforestation led by the "Rainforest Coalition". Higher population density favors the formation of local watershed protection organizations that may be able to negotiate local or – if federated – regional 'deals' (Scherr *et al.* 2001).

The potential benefits of PES for poor rural landowners and resource user groups do offer an unusual and important opportunity to shape new markets in ways that will truly drive pro-poor development. As detailed in Table 4.2 below, certain market segments appear to be particularly promising for low-income landowners and communities. This table summarizes – for developing countries as a whole – preliminary findings by Forest Trends and partners of an evaluation of trends in major market segments anticipated over the next 20 years, including the overall scale of PES for which low-income producers could be competitive providers.[8] The purpose of the exercise is to guide and prioritize investment in institutional development for pro-poor PES.

An especially strong case can be made for structuring markets for carbon sequestration to benefit low-income farmers and forest producers. Carbon can be sequestered in almost any type of site. The highest rate of sequestration per hectare is found in fertile, humid areas where trees grow most rapidly, but carbon payments are made per ton of carbon sequestered, not per hectare. Thus, sequestration investments can go to areas most in need of ecosystem restoration, increase farm productivity, or forest benefits for the poor.

[8] Market scale is in light of the overall size of financial demand, the degree of control by low-income groups of critical resources producing ecosystem services, and the interest of buyers in social co-benefits associated with their payments.

Apart from the potential of these particular market segments, the contribution of PES to rural poverty reduction can also come in a number of general forms. Specifically, PES can

- Provide cash income that can be used by local people for consumption or investment purposes (from ecosystems service payments, increased gathering of products for sale, improved enterprise productivity),
- Establish higher productivity and more sustainable farming and forest systems for local livelihoods (biomass, water, biodiversity services),
- Rehabilitate local ecosystem services of forests and agroforestry, such as watershed maintenance, pollinator species, and soil control,
- Provide a resource for community social investment,
- Contribute to improved business and market organization in local communities, and
- Provide training and technical assistance and improve environmental knowledge and appreciation.

As mentioned in section 4.1.2 on property rights, however, these opportunities and benefits will only be possible with sufficient legal and institutional underpinnings. In fact, in situations where resource rights are informal, contested or weakly enforced, potential benefits can be more than offset by the risks of loss of rights to land, to harvest products, to environmental services, to access to resources and the employment associated with this access, and loss of control and flexibility over local development options and directions, where easements or long-term contracts specify a narrow range of management alternatives (Scherr, White and Khare 2004).

Poor rural communities that are suffering from resource degradation are also beginning to become buyers of ecosystem services, paying other landowners and communities nearby to protect critical water sources and waterways. An example is the Sukhomajri community in India, which is involved in two PES arrangements: one with the city of Chandigarh for protecting its main watershed, and the other between upstream and downstream land users within the village itself for water in catchment ponds and collection of grasses (Kerr 2002).

Table 4.2. What is the Potential for PES to Benefit Poor Ecosystem Service Providers in Developing Regions Globally in 20 Years?

Compensation For:	**Philanthropic Buyers** *(non-use values)*	**Private Buyers** *(for business or personal use-value, "soft" business case, regulatory offsets)*	**Public Payments** *(for public goods)*	**Offsets through markets under cap and trade regulation** *(to offset harm to ES)*	**Consumers of Eco-certified Products**
Carbon Emission Offsets through LULUCF	Individuals and companies offsetting travel emissions	Companies offsetting through Chicago Climate Exchange for reputation or branding	Governments paying for carbon sequestration to meet national targets	Companies under Clean Development Mechanisms of Kyoto, European Union Trading Systems	Few current examples
Water Quantity or Flow	Few current examples				
Flood and Disaster Prevention/ Mitigation	Few current examples				O
Water Quality					
Biodiversity Conservation					
Landscape Beauty or Recreation			Public Park visitor fees paid to communities	O	

– Potentially millions of low-income providers could benefit; – Potentially hundreds of thousands of low-income providers could benefit; – Fewer than 100,000 low-income providers likely to benefit; – These markets segments likely to develop, but will only affect small numbers of low-income providers; O – These market segments unlikely to develop with relevance to low-income groups.

Source: Scherr, Bracer and Milder. 2006.

4.2.2. Design Elements and Issues in Targeting the Poor

An advantage for poorer and more remote communities is that – unlike conventional forest and agricultural markets – they can potentially sell ecosystem services even with poor market infrastructure, weak market institutions and unreliable access to external inputs. Some observers also suggest that for indigenous communities without a market-oriented culture, ecosystem service markets (e.g., for globally important biodiversity or local watershed services) offer a greater opportunity than product markets (Richards 1997). There is also an emerging dialogue within the international indigenous peoples' community (and to some extent, the rural development community), especially in Latin America, that sees a primary role for indigenous and rural communities as the stewards of nationally and globally important ecosystem services. In order to realize such a role, however, the structure of ecosystem service payments and markets needs to be shaped to reward good stewardship, rather than focusing – as it currently does – on modifying the behavior of "bad actors."

Much has been learned over the past decade of PES about how to design projects so that they do benefit the poor, and many lessons can be borrowed from other types of natural resource management projects. Key design elements include the following (Scherr and Bracer 2006, forthcoming; Molnar *et al.* 2006, Smith and Scherr 2002; Bracer and Scherr 2005; Rosa *et al.* 2003):

1) Provide ample opportunity for communities themselves to have meaningful input into the design of the "deal" and into oversight of implementation. This enables communities to devise their own least-cost solutions to deliver ecosystem services, and will enhance sustainability.

2) Build on prior local self-assessment of ecosystem service needs and issues, so that communities understand their own priorities, opportunities and limitations for ecosystem management locally before initiating negotiations with outside buyer interests. This is relevant even for PES made to individual land managers, to ensure that impacts of management changes will not have undesirable effects on others in the landscape.

3) Maximize program flexibility to adapt to dynamic changes. PES must be sustainable despite ongoing changes in climate, markets, local land use and population, and must learn and adapt to new innovations and information about what works. Thus, mechanisms must be in place to allow for regular re-assessment of PES agreements.

4) Work to develop PES agreements/contracts that ensure local livelihood and environmental co-benefits. The World Bank's BioCarbon Fund projects are required to demonstrate co-benefits including improved

food security, improved access to water and fuel, diversified income sources and restoration of degraded production lands (BioCarbon Fund 2006).

5) Establish eligibility criteria that include poor households and communities that contribute to ecosystem stewardship.

6) Prioritize communities that already have well-established community organizations to undertake planning, conflict resolution, coordination, etc., so that better performance is achieved at lower cost.

7) Include in the design a certification system that explicitly monitors livelihood and other co-benefits. For example, the Climate, Community and Biodiversity Alliance has developed voluntary standards to help design and identify land management projects that simultaneously minimize climate change, support sustainable development and conserve biodiversity (http://www.climate-standards.org/).

The issue of high transaction costs for PES with low-income communities can also be addressed by interventions that specifically reduce them (see below). In other cases, co-benefits from PES that provide income from improved production systems or resource management, and lower opportunity costs, may offset higher transaction costs and involve lower net payments to these groups than to competing largeholders. Overall, low-income producers may, in many cases, have potential comparative advantages in supplying ecosystem services. These include: control over environmentally critical resources, local presence that improves protection against exploitation by outside groups, in-depth local ecological knowledge, a long-term commitment to their territory, and/or lower opportunity costs for land and labor.

4.2.3. Strengthening Community Capacity to Participate in PES

Participation in some ecosystem markets requires a fairly high level of production, marketing or information management skills, and so may be unsuitable where key actors and intermediaries do not have those skills. Community ecosystem stewards need business skills to negotiate private deals effectively. Public institutions must have adequate human capacity to implement regulatory schemes effectively. In order for low-income communities to participate equitably in PES, there will need to be much greater investment in human and institutional capacity-building.

Unfortunately, capacity-building efforts to date have been fragmentary. A Forest Trends review of capacity-building for PES in developing countries found that most resources were used for agency staff, and were often generic and theoretical, rather than focused on practical issues of implementation. Few exist for community-based organizations or for intermediaries and support organizations who serve them. The limited

experience suggests that it is more effective to provide PES training to individuals and institutions that are already strong in working with communities, than to train PES technical experts to work effectively with communities. Some of the most effective community capacity-building has been done through "learning by doing" where secondary community-based organizations developed internal capacity in conjunction with pilot projects (Waage 2005).[9]

It is just as important to reinforce the role of local communities in political and negotiations process of setting and adapting the 'rules of the game' for PES, at both policy and program levels. Through Civil Society engagement in the International Tropical Timber Organization, community-based forestry organizations have contributed to policy dialogue on PES. This crucially requires resources to enable the community groups to organize themselves, prepare for meetings and attend them.

4.3. IMPROVING EFFICIENCY AND EFFECTIVENESS OF PES

All countries currently operating public PES are struggling to improve their efficiency and effectiveness, and are developing new tools and methods to do so. This section will look at some of the design innovations related to geographic targeting of PES, choosing whether/how to bundle or separate ecosystem services, and methods to reduce transaction costs and risks.

4.3.1. Geographic Targeting for PES

To develop payment systems, technical experts, producers and buyers must agree on the biophysical linkages between land uses and ecosystem service benefits, and develop suitable methods for measuring and monitoring provision of the service. Pagiola *et al.* (2002) identified the lack of good information over land uses and services as the 'Achilles heel' of payment schemes. If such information is not available or not reliable, then it might make sense to use some other instrument than PES. Absolute precision and certainty are not required, but all parties need to recognize that uncertainty will be reflected in the price buyers are willing to pay.

[9] Examples include ACICAFOC in Central America and Sierra Gorda Biosphere Reserve in Mexico, EcoTrust-Uganda.

Most public PES systems, when initially set up, have had quite inefficient targeting of funds, in that many payments went to landowners or land uses that actually did not produce the desired ecosystem services. Mexico's hydrological payments program, China's Sloping Land Conversion Program, and Costa Rica's payments for reforestation that inadvertently reduced water flow have all run into limitations due to program targeting and design issues (see box 4.3). As a result, countries with large public PES have been actively seeking to improve the geographic targeting of their payments to reduce overall costs and increase effectiveness. This has been done both by identifying more accurately the resources most critical for delivery of ecosystem services, and by devising payment systems that elicit lowest-cost providers of those services. While some of these methods are costly and require scientifically-trained individuals to implement them, the scientific sophistication and cost of targeting methods should reflect the context. More informal methods will work where there is a high degree of trust between buyers and sellers, where outcomes of land use change are readily observable by the buyers, and where the financial value of the ecosystem services is relatively low.

Box 4.3 - *Lessons Learned from Mexico and Costa Rica*

Mexico's hydrological services payment program (PSAH) and public payments in Costa Rica both identified improved water quality and quantity as the targeted ecosystem services, delimiting eligible areas as those which are located in the recharge area of an overexploited aquifer, in watersheds with high water scarcity, or where hydrological natural disasters are frequent. Using avoided deforestation as the main indicator, the program was declared a success, as only 0.1% of the nearly 300,000 ha paid for by the program was deforested. However, later studies showed that only 18% of this area was at a high or very high risk of deforestation (Alix-Garcia *et al.* 2005).

Costa Rica experienced similar outcomes, in which the majority of payments went to basins which were known to be underexploited (World Bank: Chomitz *et al.* 2006). Thus, government funds were not being utilized to their full conservation advantage. Muñoz-Piña (2005) proposed two steps to improve future targeting and efficiency of public payment schemes: 1) analyze deforestation trends and create an index as an input to program design to ensure better targeting of at risk forest areas; 2) develop an explicit grading system to differentiate proposals according to the degree of water scarcity in the land proposed, the other environmental services provided, and even the poverty level of the owners. In a 2005 review, the Mexican PSAH Technical Committee specifically recommended to formalize both of these measures in order to achieve better ecological and livelihood outcomes.

Remote Sensing Technology. One method being used to improve monitoring and ecosystem services assessments (through, for example, the tracking of deforestation trends) is remote sensing technology. Until now, most nations in the developing world have lacked regional-level to national-level information on deforestation (World Bank, Chomitz *et al.* 2006). However, due to recent technological innovations, remote sensing technology is a widely available tool with the potential to drastically reduce the cost of ecosystem evaluation and monitoring, thus paving the way for more efficient public payment schemes. By combining remote

sensing technology with geographic positioning systems and geographic information systems, policymakers and others can overlay maps of deforestation with maps of property boundaries, allowing the government to more accurately pinpoint where better land stewardship is needed.

But PES programs typically need to go beyond monitoring simply land cover. New remote sensing tools can pick up soil moisture, soil degradation and other factors (see Shepherd and Walsh 2002), as well as resolution levels, that provide superior assessments relevant to ecosystem services. In Thailand, for example, higher-resolution aerial photographs found that upland watersheds that had previously been designated as too steep for crop cultivation in fact had large areas with reasonable slopes that could be safely used for farming (Thomas, Preechapanya, and Saipothong 2004). Winrock International is using satellite and GIS-based data, mapping and data analysis, and multi-spectral aerial three-dimensional digital imagery to establish rigorous baselines and to map and monitor land use, habitat change and human impact on ecosystems to increase the effectiveness of their programs (Winrock International 2006).

Landscape modelling: These are predictive land use change assessments (i.e., they map the future of a landscape in the absence of human intervention) and can be valuable to understand the baseline of a landscape (Keane *et al.* 2002). The quality of modelling depends on the quality of underlying science on watershed function, carbon sequestration, habitat management impacts, etc. Major initiatives are underway to improve landscape models, particularly by EU, U.S. and Australian government agencies with universities. The Inter-governmental Panel on Climate Change has compiled extensive information on carbon sequestration and storage under different land uses.

More complex types of landscape modelling enable analysis of risks of loss of ecosystem functions and projections of impacts of diverse types of land use/management change. However, these are still in an early stage and in most cases would need considerable ground-truthing in particular landscapes to be the basis of payment schemes (see, e.g., Chomitz 2006).

New metrics for biodiversity: Biodiversity can be particularly difficult to target and monitor. The simplest approach is to pay directly for actual species observed, rather than habitat surrogates (e.g., $ for each breeding pair). But where this is not possible, or broader ecosystem qualities are sought, various indexes are being used. In an attempt to create an "apples to apples" transactional basis for biodiversity, the Department of Natural Resources and Environment (Victoria, Australia) developed the "Habitat Hectares" methodology. This approach, which is being implemented in Australia's BushTender program, is one way to quantify the biodiversity value of a site and how a site value could vary from a change in land management (Oliver and

Parkes 2003). Another index is the BIOS metric which integrates various indicators of biodiversity into a single index (Brand 2000).

Scoring systems: The World Bank's RISEMP project used remote sensing technology and aerial photography to identify and create a map of 29 different types of land cover types and their degradation status in Central and South America. Based on the quality of the land and type of ecosystem, the project assigned a point score according to the value of the carbon and biodiversity services on that land. Landowners were given copies of this map, enabling them to see the biodiversity and carbon score for each habitat, as well as the land use changes that would be required to enhance the value of the habitat on their land. The project was developed to encourage the adoption of silvopastoral practices in degraded pastures areas in Central and South America (World Bank 2002).

Participatory assessment and monitoring. Another important tool to use in tandem with new technologies is local knowledge and observation. Participatory, ground -based observations by citizens can be used to help interpret satellite images and to provide information that a satellite may not display (World Bank, Chomitz *et al.* 2006). One such effort is the "Degree Confluence Project," which collects volunteer photos and observations on ecosystem status at one degree intervals of latitude and longitude intersections (www.confluence.org). A variety of participatory tools have been developed to evaluate the baselines for community-based PES, including Rapid Biodiversity Assessment and Rapid Hydrological Assessment developed by RUPES (Rewarding Upland Poor for Ecosystem Services; www.rupes.org).

Reverse auctions. Reverse auctions are being used in voluntary public payment schemes to explicitly cover only the opportunity cost of alternate land uses. The self-selection process effectively eliminates those landowners whose properties' cropland value exceeds their environmental value. One example of this reverse auction approach is in the US Conservation Reserve Program. In this program, landholders submit bids specifying the environmental services they provide and the lowest price for these goods (often termed the 'rental rate') they will accept. The U.S. government then ranks the bids for cost-effectiveness, paying for that land that provides the greatest environmental impact at the lowest cost (World Bank Chomitz *et al.* 2006).

PES can serve as a spur to generate demand for high-quality monitoring and research on ecosystem services, that in turn will facilitate targeting. However, determining pricing and the opportunity cost associated with conservation-based land stewardship is not simply a technical and economic issue. Programs may still, for political reasons, want to pay the same rate to all actors who are good stewards, regardless of their overall impact on key ecosystem services. But then PES managers must recognize those "empty" payments as an

element of cost, representing their "social license to operate the PES" and apply those costs to the total for ecosystem services the program cares about.

4.3.2. Paying for Bundled Ecosystem Services

From an ecosystem perspective, it would often be ideal to reward good stewardship for the full range of ecosystem services, rather than to focus on specific services because they have a market. Moreover, as indicated above, the level of payments in most PES are not, under current market conditions, generally high enough to fully offset opportunity costs or cover necessary investments for the change in land use. It is thus essential to have complementary income flows, either from commercial and subsistence products from the resource, or from payments for other ecosystem services.

Indeed, it is feasible to manage for multiple services. For example, carbon sequestration or storage services can be bundled with most other ecosystem services that involve re-forestation or vegetation, adding soil organic matter, etc. In these cases, the most common limitation to bundling is the requirement that payments be for "additional" ecosystem services provided and buyers refuse to pay for services already flowing. The rules established for CDM and other carbon trades are hampering bundling in this way (Smith and Scherr 2002), although adding biodiversity benefits into carbon projects is generally not a problem.

In other cases, there may be a trade-off between the provision of different ecosystem services. Examples are where biodiversity conservation calls for maintaining habitat cover that reduces waterflow downstream in the dry season, or land use patterns that benefit certain wild species may limit others.

New approaches are being explored in some public payment systems, particularly in developed countries, to assign overall ecosystem values to lands – creating "ecosystem credits" – so that landowners who have been good stewards in the past would receive payments as well as those who improve degraded lands, and so that integrated ecosystem service management would be recognized and encouraged (Aldyen Donnelly 2005). It is expected that as markets mature, new institutional mechanisms will develop to overcome current barriers to bundling. While private sector or sector-specific public agencies may only be interested to pay for the specific service they want, aggregated groups of land and resource stewards can management their resource to separately sell those services as needed. (See example of Hancock forests, New South Wales).

4.3.3. Reducing Transaction Costs and Risks

Transaction costs include the cost of attracting potential buyers (such as establishing ecosystem service potential), costs of working with project partners (such as negotiating with project participants and capacity-building), and costs of ensuring parties fulfill their obligations (such as contract development and enforcement, legal costs and insurance, and monitoring of ecosystem services). In cases where buyers are physically and socially remote from sellers, a chain of intermediaries may be required for the transfer of funds. One preliminary assessment suggests that transaction costs in forest carbon projects (presently the most complex market) absorb more than 50 percent (and in some cases more than 90 percent) of the value of total payments made, while the forest producer directly receives only the residual (Niles *et al.* 2003).

Comparing Costa Rica's FONAFIFO program with China's FLCP and FESCP finds that transaction costs in Costa Rica are considerably lower. FONAFIFO's costs are 7%, plus a top cost of 18% for the forest engineer, while some research in China suggests a figure of 65%. The potential of PES to deliver new streams of income to rural communities depends crucially on reducing costs and risks throughout the 'value chain' for PES. Some pilot PES projects have found various ways to dramatically reduce these costs and risks:

Simplifying the rules. A rule of thumb is to use simplest rules possible and the simplest compliance mechanisms that will satisfy the buyer/beneficiaries in the contract. One way to reduce transaction costs is to simplify modalities of PES programs, for example, for determining baselines and monitoring carbon outcomes. Standardized measures can be developed and scientifically evaluated, to serve as proxies for detailed measures. An example is simplified carbon emission reduction credits, calculated using standridzed reference emission rates for different land use activities in defined locations. If necessary, an uncertainty discount could be applied. Independent bodies would determine the reference rates and verification would only involve a third party confirming that activities had been undertaken (Sandor 2000, cited in Landell-Mills, et al 2002).

Facilitate buyer-seller linkages. Most PES involve buyers and sellers who are geographically and socially distant from other another. The search costs to find partners for PES transactions can be quite high, as are the risks. Various approaches have been developed to address this problem. Some countries have established "1-stop shops' for potential buyers of carbon emission offsets, where they can find out all the relevant rules, identify pre-screened sellers, and learn about locally knowledgeable market intermediaries. Governments, NGOs and private sector groups have also established temporary platforms for buyers and sellers to meet one another face-to-face and share information about resources and needs. The Katoomba Group's *Ecosystem Marketplace* has begun to post information electronically about offers to buy ecosystem services.

Simplify insurance. Since PES involve contracts for delivery of services, mechanisms must be put in place for either sellers or buyers or both to insure against non-delivery. One approach is self-insurance, whereby land stewards produce more services than they have contracted (for example, by planning extra area for carbon offsets), or buyers contract for more services than they need. In Guatemala, for example, markets for watershed services needed plans to offer three times the area, to ensure delivery of contracted services to the investor. In some cases, NGOs absorb risks of PES contracts, although care must be taken that they explicitly recognize the organizational risks to themselves and actively manage them. Governments often play the role of absorbing the risk of both buyers and sellers, but this should probably be seen as transitional. PES risks can be reduced by diversifying sources of funds. For example, China's PES is carried out, at all levels, by government agencies. FONAFIFO of Costa Rica, while state-created, has the ability, and flexibility, of being able to behave as a (relatively) private organisation. In CR the funds come from earmarked taxes, while in China they come from general budget, and are thus subject to greater fluctuations in funding (IIED 2005).

Exploit economies of scale. As costs such as project design, management and certification are characterized by economies of scale, project size has an important effect on unit costs. Transaction costs can be greatly reduced by developing projects in communities where there are already active local organizations and participatory development programs in place, with community representatives already selected and authorized to negotiate with outsiders. For example, organized indigenous communities in El Salvador have done their own diagnostic studies of local needs and priorities and are actively marketing specific ecosystem services from specific areas, that would contribute to meeting those priorities (Rosa *et al.* 2003).

If critical ecosystem services are found in areas with little organization, NGOs or public agencies with an interest in co-benefits may be willing to cover selected transaction costs for community organization needed for payments for ecosystem services. Intermediary groups with expertise in community organization can take responsibility for local project management and mediation between investors and local people. Where highly specialized expertise is needed, this can be contracted in. Because carbon can be sequestered in almost any site (unlike more site-specific biodiversity and watershed services), area-based projects (sometimes called "bubble projects") can be designed in which an entire jurisdiction commits to a defined increase in forest cover or area of forest protected. This increases land use flexibility, and is especially useful for landscape mosaics dominated by non-contiguous forest patches (Smith and Scherr 2002).

Projects may be pooled together in a 'mutual fund' type arrangement to significantly lower transaction costs and the risk of individual project failure, and offer specialization. For example, the independent non-profit

Face Foundation has developed a portfolio of five projects in five countries, affecting 135,000 hectares that are sequestering 82 million tons of carbon (Emmer and Verweij 2000). The World Bank's Prototype Carbon Fund, BioCarbon Fund and Community Development Carbon Fund are also examples. National and local Environment Trust Funds could also pool investments.

Intermediary organizations can attract investors by 'bundling' projects within a country to market a large supply of ecosystem services (e.g., carbon offsets). For example, Costa Rica markets certified Tradable Offsets from two large national 'umbrella' projects for forest protection, regeneration and reforestation on over a million hectares of mostly small-scale farm-level contracts (Chomitz, et al 1999).

Institutional coordination. Enabling smaller-scale forest producers to participate in ecosystem service markets also requires institutional innovations from the government to reduce marketing costs and reduce risks to outside buyers and investors. As some markets mature, more open trading systems will begin to replace closed deals, and producers, buyers and investors will develop cooperative institutions. Intermediary organizations will attract investors by 'bundling' projects within a country or region to market carbon offsets, biodiversity credits or watershed services.

Many market schemes require the organization, training and management of large numbers of people to develop management standards, assign values to credits, provide technical assistance to design interventions, negotiate contracts, and monitor and verify compliance. Technical specialists and land users need to work jointly to define the appropriate "commodity" that reflects clear, verifiable links between forest management and ecosystem service output, and develop alternative performance standards where there is an imperfect understanding of ecosystem functions.

Cap-and-trade programs, and private PES involving numerous buyers and sellers, require master registries for the jurisdiction in which obligations and credits are recorded. Secondary markets for such credits may be established in security exchanges. In many cases, existing institutions, such as financial services, legal services and other business support services can acquire the specific knowledge and skills to work in ecosystem service markets.

4.4. ENGAGING PRIVATE SECTOR FIRMS AS BUYERS

Potential private sector buyers of ecosystem services represent a critical opportunity for conservation, as the potential scale of private sector payments dwarfs current and potential payments from governments and civil

society. However, a meaningful level of private sector involvement will not materialize unless the institutional conditions outlined in the above sections are met. Reducing investment risk by creating a more favorable investment climate – through more secure tenure rights, stricter enforcement of environmental laws, etc. – is essential in any efforts to engage the private sector.

Private sector involvement, moreover, cannot shoulder the burden of conservation; governments must play a prominent role in the protection of public goods such as habitat conservation and watershed protection. Historically this has been attempted through public ownership, taxation, or other public payment schemes. However, "governments have their own failings associated with imperfect knowledge, misaligned incentives, inefficient bureaucracies and rent seeking. Furthermore, as pressure mounts on governments to curtail spending and cut budget deficits, their ability to invest adequately in the provision of public goods and services is called into question (Landell-Mills and Porras, 2002). China and many other countries around the world have found themselves in this public good conundrum, and are making efforts to transfer responsibility away from the public sector by combining command and control approaches with more market-based approaches. While ecosystem protection is a public responsibility, transferring some of the mechanisms for these payments to the private sector can help relieve some of the financial and managerial pressure from the government. Experience has shown that this is indeed more efficient, not only in the case of ecosystem services but also in the case of long-term forestry concessions, trade liberalization, forest certification, and the promotion of markets for non-timber forest products. Simply stated, well designed market approaches tend to achieve the desired environmental goals at a lower cost than traditional heavy hand regulations (Landell-Mills and Porras, 2002). Furthermore, experiences with cap-and-trade markets in the USA, most notably wetland mitigation banking and conservation banking, illustrate that when properly established, regulated markets can trigger major investments in markets for ecosystem services (Mulder *et al.* 2005).

4.4.1. Conditions for the Emergence of Private Sector Buyers

Countries with the underlying institutional requirements for reducing investment risk have had success in mobilizing private buyers, but other important barriers must also be considered; the market for ecosystem services is so embryonic that most observers do not yet fully understand where the best opportunities lie, nor the full extent of market limitations. At the same time, because buyers are not monolithic, each industry and/or type of ecosystem service will vary in terms of barriers and motivations for its market actors. The

private sector will only start investing in the conservation, or sustainable use, of ecosystem services under the following circumstances:

- They are forced to by regulation or when it is very likely that regulation will come into force in the (near) future.
- Payments deliver a return on their investment, either in terms of financial- or non-financial benefits.
- Payments are made for charity or philanthropic reasons (i.e. donations).

The pressure to start paying for ecosystem services decreases, of course, from "regulation or threat for regulation", to "business benefits", to "philanthropy". A study commissioned by Forest Trends which recorded more than 100 cases of private PES and more than 1100 transactions of private PES, identified strategies to engage buyers (Mulder *et al.* 2005). These are summarized in the following sections.

4.4.2. Making the Business Case for PES

In the absence of regulations such as cap-and-trade policies, pitching PES to the private sector becomes more challenging. In order for companies to voluntarily get involved in PES, there must be a scientific and political consensus on the efficacy of ecosystem service payments in general, and on which potential PES locations will have the highest environmental payoff. Unlike in public payment schemes, where success is often measured by increased forest cover or other more general environmental indicators, companies mainly measure their success on unit-for-unit improvement (for example, pounds of nutrient pollution avoided or tons of carbon sequestered). China and other nations moving from public payment schemes to private investment must also focus more on product delivery and qualitative ecosystem service improvements.

For voluntary ecosystem service payments, companies must be convinced of the direct and indirect business benefit. These benefits underlie the motivations presented in Table 4.3 below. Direct business benefits include legal compliance, cost reduction, decreased risks, increased profits, and improving the quality of the raw materials necessary for a company's products or operation (i.e. clean water). Indirect benefits include license to operate (regulatory goodwill), improved reputation (and reputational risk management) and brand equity, increased employee satisfaction and improved quality of staff recruitment, and reduced future liabilities.

Table 4.3 - Types of Motivations for Private Engagement in PES

Motivation Type	Details
Philanthropic	▪ Ethical or environmental values of business owners *(e.g., Voluntary carbon emission offsets, use of eco-certified inputs)*
Regulatory compliance	▪ Legal requirements for offsets ▪ Cap-and-trade regulatory system ▪ Compliance with international conventions, such as Convention on Biological Diversity or Ramsar
Direct financial "business case"	▪ New business opportunities, opportunities to increase sales or profits. ▪ Reduce environmental risk *(e.g., insurance industry, eco-efficiency)* ▪ Enhance or maintain the financial value of land, forest or other assets belonging to the company. ▪ Strengthened market segments for eco-enterprises ▪ Secure, sustain or reduce costs of key natural resource inputs required for business operations. *(e.g., uncontaminated water needed for bottling plant or natural filtration of water more cost-efficient than building filtration plants, as in New York and Pimampiro, Ecuador)* ▪ "Charismatic" macro fauna or landscape beauty needed for eco-tourism Operation *(e.g., Melia Conchal hotel chain in Costa Rica)* ▪ Genetic resources needed for pharmaceutical company (i.e. bioprospecting) ▪ Conservation of watershed to secure water flow regulation
Indirect, non-financial "business case"	▪ Securing 'social license to operate' by managing potentially difficult relationships with local communities and others, avoid disruption/ losses from protests ▪ Voluntary carbon- and biodiversity offsets to preserve reputation *(e.g., construction companies, land developers, oil and power companies like British Petroleum and American Electric Power)* ▪ Regulatory good will: better relations with regulators, supporting formal license to operate in the future. ▪ Complements or enables compliance with other guidelines *(e.g., Equator principles; ISO 14001 guidelines; (3) International conventions such as CBD or Ramsar Convention)* ▪ Support strong "green" branding ▪ Differentiation in the market: Use of marketing purposes to influence consumers, investors or others committed to "green" products ▪ Improved staff pride and morale, enhanced recruitment and retention of superior staff ▪ Reflect/consistent with broader business values of the corporation (commitment of CEO to "good husbandry")

Source: Mulder, ten Kate and Scherr 2005.

Associated with these motivations are also barriers to private sector engagement in PES. First of all, in a considerable number of cases indirect business benefits are the most likely to be obtained. Though, these benefits are important – since they can save companies time and money (e.g., in speeding up permit negotiations because of regulatory goodwill) – they are often difficult to grasp and measure and may therefore hamper the growth of investments in ecosystem services. Making a mechanism available that is accepted by

potential buyers to realistically compare other business benefits with actual payments made for ecosystem services could significantly contribute to triggering demand and increase incentives for investments.

The benefits of PES are also clouded by a lack of knowledge on the part of business leaders about the role and value of ecosystem services to their business and the lack of internal capacity to plan and manage PES. Multi-sectoral dialogues are slowly removing these barriers, but a lack of necessary institutions to establish PES and a lack of publicly endorsed mechanisms for making these payments, continue to make some companies wary. Corporations need an aggregation body in which they are confident – this means that companies want a governance role, or at minimum a say in how funds are administered, a desire often stemming from mistrust of the government as an aggregation body. Having an aggregation body that market participants trust will also help to mobilize small enterprises or communities and allow them to participate in developing PES markets with the assurance that the conditions required for a deal will be met.

These barriers and the motivations listed in Table 4.3 suggest a number of strategies that governments can use to catalyze private sector engagement in PES. These include the following:

- Introducing or strengthening regulations at international, federal, state or local level; fix problems with current regulatory policies;
- Increasing direct pressure or engage media on issues of concern (PES may be disconnected from an issue under scrutiny, but may provide an overall boost to reputation);
- Quantifying risks by providing stronger financial data on implications of losing certain ecosystem services, thereby persuading the private sector to buy more environmental insurance. For example, describing risks to availability or quality of raw materials. Operating risks and ability to grow may also be negatively impacted by a decline in ecosystem services;
- Quantifying cost reduction opportunities for investing in ecosystem services rather than later cleanups, for example;
- Quantifying benefits and, if significant, promoting case studies to business;
- Exploring opportunities to include payments for ecosystem services as part of deals structured with local communities (e.g., requirements could be included in the relevant permitting process);
- Influencing insurance companies to evaluate ecosystem performance;
- Influencing lenders to provide lower interest rates or easier access to loans for companies that invest in ecosystem services;
- Influencing investors and analysts to include evaluation of ecosystem risks (ranging from raw materials costs, operating costs to ability to expand into new markets) and the company's response to that risk.

- Conducting sector-specific analysis to understand buyer needs across industries. Companies and other private entities that are currently active in ecosystem service markets are clearly front-runners, and represent just the tip of the iceberg in their sector. It is likely that there are many more areas in the world where the conditions to set up PES (-like) schemes are possible. Furthermore, a number of sectors, such as advertising, are currently not involved in PES but have potential.
- Disseminating the results of successful case studies to promote private sector participation in PES.

Despite existing barriers, private sector investment is on the rise, encouraged by the successful experiences of other companies. Private sector buyers of PES include the following:

- Water: Agriculture sector, hydropower companies, construction/land development sector, food and beverages sector, municipal water users;
- Biodiversity: Pharmaceutical/horticulture sector, energy/oil/petrochemical companies, construction/land development sector, food and beverages sector, tourism sector;
- Scenic beauty: Tourism sector, commercial/advertisement sector;
- Carbon: Forestry sector, energy/oil/petrochemical companies and industry, car manufacturing industry.

Eco-certification of products grown in ecologically-compatible ways is growing both internationally, and in some middle-income countries such as Brazil and Mexico. While consumers have led growth in some segments, most new market development has been mobilized by major wholesale buyers who use the products to market their corporate brand, and by professional groups such as architects and builders, who control purchase of large quantities. Governments often play a key role in increasing the scale of eco-certified product markets through their own procurement policies, and by raising awareness among companies about economic opportunities.

Finally, the biophysical component also needs to be assessed and understood before major demand will emerge. Most current initiatives, especially related to water services, lack hard scientific evidence that ecosystems indeed deliver the services that a buyer has paid for. Although in a considerable number of initiatives in the carbon market estimates are given on the anticipated amount of carbon sequestered (often in tons or CO2/ha), this is not widespread for other services. Understanding the dose-response function relating to land use and management with the provision of ecosystem services is crucial in order to get possible buyers interested.

4.4.3. Institutional Issues for the Development of Private Sector PES

The long-term promise of PES is its potential to mobilize large financial flows from the private business and consumer sectors for the conservation and management of ecosystem services. While governments can help to organize PES involving the private sector, new institutions—mostly in the private and civic sector—will need to develop. Moreover, in order to increase private demand for ecosystem services, capacity building at the corporate level will be needed, as well as the public, through civil society as well as government programs.

The United States provides some interesting examples of private sector institutional development for PES. Though the U.S. did not ratify the Kyoto Protocols, many individual states have established carbon emission reduction targets and have established carbon trading schemes. Climate and Biodiversity exchanges have been set up in both the US and Australia.

Governments need to provide secure legal frameworks for PES contracts, and find ways to ensure legal protections for buyers and sellers without overburdening the process and costs with bureaucracy. There is also a need to ensure public oversight of private schemes, to ensure they are congruent with public ecosystem services, especially where these have the potential to compete (as in some watershed or biodiversity services).

In cases where multiple buyers need to be engaged in order to finance the coordinated management of ecosystem services to benefit the whole group, new institutions will be needed to aggregate buyers and provide a mechanism for joint decision-making. At the same time, private buyers will wish to link with aggregated groups of sellers to reduce transaction costs. Existing community and producer organizations will need to build capacity to engage in these negotiations and manage PES contracts. Market intermediaries need to be engaged who understand how to negotiate cultural and social differences between buyers and sellers.

5. IMPLICATIONS AND RECOMMENDATIONS FOR CHINA

This section synthesizes the lessons from international experience presented previously into a set of particular implications for China. Overall, the wealth of experience gained from implementing the SLCP and FECF, combined with increasing local experimentation in using market-based policy instruments for environmental conservation, suggests that the future of PES in China is promising. Furthermore, international experience provides a number of insights for Chinese policymakers in their goal to realize this potential. These include what types of models look the most promising for China, what types of policies and institutions will be necessary for PES programs to be effective, what are the important issues regarding technical design, what is the potential of PES for poverty reduction, and how the private sector can be engaged as participants in PES programs and ecosystem service markets.

5.1. PROMISING PES MODELS FOR CHINA

International experience suggests that a number of promising PES models exist for China. These are:

Watershed Services

The various local experiments in protecting and paying for watershed services that are developing throughout China in response to growing pressure on limited water resources suggest that PES between drainage-area water users and upper watershed service providers are promising.[10] International experience indicates that these types of schemes are straightforward to set up due to the relative ease in identifying beneficiaries and the clear linkages between land management practices and outcomes. In the case of China, these types of PES schemes could not only help to improve protection of upper watershed services in face of weak enforcement of existing regulations, but could also serve as a useful platform to resolve the conflicts surrounding these services. A well-designed PES scheme in the case of the Miyun reservoir, for example, could do much to reconcile Miyun county's goal of improving local livelihoods with Beijing's need to ensure a stable, long-term source of clean water, likely at significant long-term cost savings over the current strategy of trans-regional water diversion from Cetian reservoir in Shanxi Province (Peisert and Sternfeld 2004).

[10] A few examples include the water rights transfer scheme between Yiwu and Dongyang cities in Zhejiang Province, and the framework of integrated watershed management developing between Beijing, Tianjin and local governments in the upper watershed of the Miyun reservoir.

The challenges that central and provincial governments face in effectively controlling industrial point-source pollution and the need to stimulate greater adoption by industry of "green" technology suggest that cap-and-trade systems for industrial emissions and effluence could be a valuable future policy option, though one contingent on better monitoring and enforcement capacity. China's current experiment with emissions trading in cooperation with the Environmental Defense Fund, which encompasses four provinces and three cities, including Shanghai, will provide valuable insights into the types of institutional and legal reforms that China will need to develop these systems.

Biodiversity and Landscape Restoration

China's fast rate of growth and wide-range of economic activity and development represents a potentially huge source of financial resources to pay for ecosystem services via offsets for unavoidable damage of development activities. Offsets requirements in development permits could be institutionalized, beginning with the most extractive industries such as mining, and then expanded to a broader array of sectors. The State Forestry Administration's Forest and Vegetation Restoration Fee (*senlin zhibei huifufei)*, as well as the various fees levied by national and local governments for ecological damages caused from construction and engineering projects, suggest that the policy framework for offsets already exists. The next step would be to redesign and standardize the system and legal framework to replace monetary fees with actual offsetting activities, implemented by the developer in question or a third party. The restructuring of development activities to better internalize their environmental costs will help to ensure a more rational and sustainable course of economic growth. Pending better prioritization of conservation objectives as well as the capacity to monitor and enforce these offsets, this system could also be extended to include cap-and-trade systems similar to the US's wetland mitigation banking and conservation banking.

Significant potential also exists to improve and build upon current schemes for rural ecosystem restoration and protection. The Sloping Land Conversion Program (SLCP) and Forest Ecosystem Compensation Fund (FECF) could serve as starting points for more regionally targeted schemes aimed at specific types of forest ecosystem and watershed services. Also promising are PES that involve payments to communities bordering nature reserves as a means to reduce encroachment, improve the monitoring and protection of biodiversity, and to compensate these communities for the negative welfare effects that creation of some reserves has had on their sources of livelihood.

Similar to international trends, eco-labeling also shows significant promise as a means for China to better internalize the environmental costs of agriculture, and could also be promoted through market research of international opportunities for ecological value-added products. China's current system, regulated by the China Green Food Development Center of the Ministry of Agriculture, can be further expanded to include certification based on measures of environmental benefits other than low chemical input use and food safety, such as environmentally beneficial land-use practices, fishing practices, etc. Private certification schemes can also be fostered, along with a legal framework and system of government oversight.

Carbon Sequestration and Storage

Though markets for carbon sequestration can in some cases be very profitable, international experience indicates that potential sellers often find it difficult to enter the market due to insufficient internal capacity. This suggests that China can work with both private and public forest companies, agricultural and forest communities and individual households to help them assess opportunities to engage in PES for carbon sequestration and to develop a business case for them to become sellers. Portions of SLCP and FECF area could also be considered for entry into carbon sequestration PES. Significant potential also exists for domestic carbon trading schemes for China to meet its climate change objectives, especially for major emitters who are not also major polluters (since these must clearly reduce emissions, not offset them). These types of schemes, furthermore, could help link private sector buyers with PES aimed at poverty reduction and ecosystem restoration.

5.2. POLICIES AND INSTITUTIONS

International experience indicates that fundamental institutional and legal reform is often necessary for ecosystem service markets to develop and function effectively and efficiently. Of greatest importance is that de facto and de jure land tenure is sufficiently long-term and stable. In the case of China, though the Village Land Contract Law clearly stipulates tenure lengths for contracted agricultural land of 30 years and for forest land of 30-70 years, de facto tenure has been found to vary significantly across locales (Liu et al. 1998; Brandt et al. 2002). Though in many parts of rural China de facto individual or community rights and tenure security are sufficient for PES, the lack of stable tenure and enforcement in other parts will not only hinder the ability of PES mechanisms to improve local livelihoods, but could actually worsen the situation by creating incentives for local and provincial government seizure of valuable ecosystem service flows. Similar to some

experiences from other countries, these types of outcomes have, in fact, already occurred under the SLCP and FECF. This suggests that policymakers could greatly improve the functioning of current and future PES programs by strengthening enforcement of de jure land tenure as part of China's on-going transition towards a system of clearly delineated private agricultural and forest land rights.[11]

Over the long term, the government might also consider how to better rationalize its administrative structure regarding environmental management so as to reduce overlapping administrative purview. For example, land management in its various forms – and thus the ecosystem services provided by it – falls under the control of no less than four central government agencies (not to mention provincial-level entities): the Ministry of Land Resources, the Ministry of Water Resources, the Ministry of Agriculture and the State Forestry Administration. As a step towards more efficient environmental management, cross-agency frameworks could be developed and strengthened to facilitate the pooling of resources and expertise, the coordination of effort and the sharing of responsibility.[12] The SLCP, for example, could benefit from joint management by the Ministry of Water Resources, which has experience, expertise and vested interest in effective and integrated watershed management and in combating soil erosion. More clearly demarcated responsibilities combined with well-developed platforms for cross-agency cooperation would also reduce incentives for individual agencies to use PES programs as a means to expand their power, responsibilities and budgetary allocations, which can adversely impact program effectiveness.

Though the above-mentioned reforms will clearly require time and effort, international experience suggests that China has a number of more immediate measures it can adopt to set the stage for better design and implementation of current and future PES schemes. To begin with, the many problems encountered in implementation and budgeting of the SLCP and FECF should not dissuade policymakers from their continuation. The world's other large land-retirement program – the US Conservation Reserve Program – has itself faced targeting and implementation challenges, and through a long process of trail and error has improved. Viewed from this perspective, implementation of the SLCP and FECF has created a wealth of local and national experience and of momentum generated – in terms of local dialogue and capacity-building in rural resource management – which the government can build upon.

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[11] Lack of clearly delineated forest land rights, for example, has resulted in conflicts over rights to forest and ecosystem resource use in west China (Yeh, 2000).

[12] An example of this is the U.S.'s newly-implemented inter-agency initiative on PES.

Important for achieving this is the need to move away from the current top-down, "one size fits all" approach to rural environmental policy (Cook 2004; Xu et al 2006). International experience indicates that working closely with local governments and communities will help to ensure that present and future programs are successful. Chinese policymakers clearly recognize the key role that local governments and communities play in how central policy is ultimately implemented, implicitly allowing for this by building in a degree of ambiguity in central directives. It should thus be a relatively easy next step to explicitly bring in these key actors as equal partners in all stages of developing PES mechanisms and ecosystem service markets.

Communities that have autonomy in participation choice (including the freedom to refuse to participate if it is not in their best interest), an important say in design and implementation so that programs address their needs and constraints, and a real stake in outcomes will have the incentives to ensure that PES programs are cost effective, properly implemented and sustainable.[13] Local planning will help to identify the best strategies for ecosystem service protection overall and where PES schemes can play a useful role relative to other solutions. Close consultation with communities can also help to engender a greater sense of environmental stewardship, and to provide a clearer picture of the relative costs and benefits of ecosystem service provision, which is a necessary component to improving conservation strategy and minimizing adverse incentives.

Related to this, present and future public PES programs could be improved by covering local implementation costs in program budgeting. At best, this should be done through a process of open and fair negotiation with local governments, and would help to reduce incentives – in absence of more fundamental land rights reforms – for these key actors to recover administrative costs through problematic and potentially damaging implementation strategies. This is a particular concern given the fiscal decentralization of, and consequent budgetary crises faced by local governments throughout China (World Bank 2002). Lack of sufficient budgeting for local implementation costs has possibly been one of the key factors contributing to overly quick expansion of SLCP (Xu et al 2006; Bennett 2006).

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[13] The successful and ongoing social forestry project implemented by Yunnan's provincial Forestry Department in the upper Yangtze River watershed, as part of central government's Yangtze River Shelterbelt reforestation program, is one example of the value of empowering local stakeholders. A case study of this project found that close and regular consultation and communication with local communities on all aspects of program design and implementation, combined with sufficient technical support, served to ensure significant program success, resulting for one village in an increase in forest cover form 18% to 30% between 1993 and 1998 (Kitamura and Cao 2003).

This process can also be greatly facilitated by fostering government and community-based institutional capacity-building, especially in poorer regions which lack the necessary human capital and financial resources. As a means to facilitate this, local governments and communities could be encouraged to link up with international organizations in local capacity building projects (Chen and Uitto 2003). Strong, transparent and participative local governance structures are also important. This could be made an explicit target within the government's current initiative to revise the rural election law to protect the democratic rights of its farmers and promote village democracy, in line with the 11th Five-Year Guidelines.

In the backdrop of this, the central government could develop a strategic framework through which its role in current and future ecosystem markets can be slowly shifted from designer and central manager to a provider of services to foster innovation, link buyers and sellers, enable the flow of information and expertise, reduce financial risk and enforce laws and contracts. The long-term financial sustainability of PES programs will rely not only on local innovations to cut costs and improve outcomes, but also on greater private sector participation and financing.

Cross-sectoral platforms for learning and dialogue could be developed as part of this. There is a need for the various groups in China that play different roles in PES and markets to meet regularly for cross- learning. The government, China's academic community and the international community all can be involved in bringing these groups together in a network similar to current international organizations (e.g., The Katoomba Group) to facilitate the exchange of ideas, information and experience to identify conservation and market opportunities, needs and constraints in developing viable PES models for China.

Overall, creating and strengthening channels for sharing experience and disseminating knowledge, both within China and with the international community, will help China to better learn from its own process of developing ecosystem markets as well as from a growing international knowledge base. This goes hand-in-hand with the development of China's domestic scientific and policy expertise in identifying and tackling its environmental challenges. Educating policymakers, the private sector and the general public on their reliance on ecosystem services has also been shown to increase participation in payment schemes. China could improve its education on these issues, potentially doing a footprint analysis to see where opportunities are and establishing a knowledge base of which economic sectors are major users of ecosystem services, and who should therefore be buyers and sellers.

5.3. TECHNICAL DESIGN OF PES

The global experience regarding PES highlights the benefits that clarification of national and regional environmental priorities can have for improving design and implementation of current and future public PES schemes. This would involve identifying key regions and ecosystem services to target, and could also include a footprint analysis to see which sectors and actors have the largest impacts. Better prioritization can improve the effectiveness of biodiversity offsets, since areas impacted by development (e.g. mining) – though often small and of little conservation value – can be offset by conservation efforts in larger natural areas with better long-term conservation prospects, ensuring greater connectivity of high biodiversity value areas.

Current PES schemes – in particular the SLCP – can be improved by clearly setting out what ecosystem services are being targeted. If multiple services are targeted, as is implicit in the SLCP's current plan, these could be made explicit and prioritized if possible so that better measures of targeting and performance can be developed, and because different services are often furthered by different land use practices. If watershed services and reduction of soil erosion are the most important goals for the SLCP in the arid north-central Loess Plateau region, for example, then converting retired area to grassland could be a more viable and cost-effective option. Trees use water, and thus the region's strained water resources make both the achievability and desirability of a large-scale afforestation drive questionable. If, on the other hand, carbon sequestration or forest ecosystem restoration is the main objective, then focus on other regions for this would be more cost-effective and viable.

Overall, an important aspect of PES is the need for research on the impacts and scale effects of different ecosystem management activities. Both local institutional constraints as well as national scientific capacity need to be taken into account to develop the most appropriate management and targeting methods. The degree to which ecosystem services are bundled in PES schemes, and the sophistication of the targeting methods used, will both be reflected in overall programs costs.

A learning process is an inevitable part of any PES initiative. The government can better capture the benefits of this process by allowing greater flexibility for adaptation to local economic and ecological conditions, and then by disseminating the results of these experiences (both successes and problems encountered) to practitioners and policymakers. As part of this, China's domestic scientific and academic community could be

more closely engaged in the process, perhaps serving as a neutral third party to survey and evaluate current and future public PES schemes.

5.4. PES AND POVERTY REDUCTION

Significant potential exists in China for the use of PES schemes to reconcile the dual goals of environmental amelioration and rural development, as laid out in the 11th Five-Year Guidelines. PES mechanisms can be used to give rural dwellers a new social role as ecosystem service providers for ecosystems under stress. They should be rewarded for good stewardship where clear financial values are involved. International experience indicates the level of these payments often does not need to be large, only comprising a share of total household income, because these households and communities already have the incentive to protect and improve their local environment. PES can thus serve to help them achieve these goals while financing the transition to more profitable and ecologically-friendly production systems.

Current experience suggests that private PES schemes tend to arise in areas with higher incomes and better institutions and infrastructure. The government could thus more efficiently focus public PES initiatives at poorer, more remote areas where private initiatives are unlikely to take shape. One area where this could be useful is regarding China's nature reserve system. Well-designed PES schemes targeted at communities that were previously dependent on reserve forests could not only help to ensure that the livelihoods of these communities are not harmed in developing the reserve system, but could also serve to improve reserve management in a cost-effective fashion. As key stakeholders, these communities and are well-placed to effectively monitor and manage reserves.

In terms of the broader picture, international experiences suggests that PES aimed at both achieving environmental goals and contributing to local livelihoods are most effective when designed within a larger rural development policy framework. This will help to reduce the risk that multiple programs implemented by different agencies will create conflicting incentives. Looking at how rural PES schemes fit within the larger picture of rural development will also help policymakers to better prioritize and understand the relationships between natural resource use/degradation and rural development, and to identify where PES are the best option.

5.5. PRIVATE SECTOR AND PES

Significant potential for private-sector involvement in and financing of PES exists for China. As a means to bring in the private sector, the government could begin to make a stepwise transition from fully public to public-private partnerships and private initiatives in a way that make sense in the Chinese context. A legal framework will first need to be provided that will facilitate individual companies to make small PES deals. How best to organize public oversight of private deals to make sure they don't interfere with provision of public goods also needs to be determined. At best, this should not involve an overly burdensome process.

To learn about the process, the government could first conduct a number of pilot projects to inform policymakers about what types of formal, large-scale frameworks will work. Looking ahead, the growth and deepening of ecosystem markets will result in the appearance of private sector service providers and intermediaries. The question, then, is how best China can foster the private sector and civil society to provide these. The government will also need to improve its understanding of where private financial benefits do and don't overlap with public ecosystem service benefits. Finally, current and future public PES could be designed with private sector buyers in mind.

A strong "business case" to buy ecosystem services requires not only that the value of services secured is higher than the value of the expenditures, but that this investment of resources makes sense for the business relative to other types of investments (i.e. that not buying is really a threat, or that returns are higher). To gain better insights into where these conditions are satisfied in China, the private sector needs to be engaged in dialogue and given examples of companies that have benefited from PES.

5.6. A PROCESS AS WELL AS A DESTINATION

Overall, policymakers in China should recognize that the development of PES mechanisms is as much a process as it is a destination. No single set of policy tools and targets will provide a definitive solution to China's environmental priorities and challenges, since these will change as its economic, institutional and scientific capacity develop. Though it is important to have targets for ecosystem health, targets are not so useful regarding the specific activities to get there, since the latter will need to evolve and often in unanticipated directions. The process of building and revising PES instruments is thus valuable in itself, since it stimulates the ongoing dialogue, capacity-building and the institutional and legal reforms needed to better identify and align the social costs and benefits of environmental protection and ecosystem service provision.

It is through this process as much as it is through the adoption of any particular set of market-based instruments that China can gain greater flexibility and adaptability in reconciling the dual goals of conservation and development. China's environmental strategy could thus be improved through a more process-oriented and less target-oriented approach.

The nurturing of dialogue is an important outcome of this process. Dialogue between different agencies and levels of government and the various stakeholders involved, for example, will be necessary for resolving the key questions underlying establishment of ecosystem services markets and PES mechanisms: Who buys? Who sells? What is the value of the ecosystem service in question? Who benefits?

Dialogue with local governments and communities will also be crucial for ensuring that market-based instruments can contribute to rural equity and growth. Cross-jurisdictional dialogue also needs to be fostered and strengthened, both through formalized structures as well as informal channels; this is crucial for resolving issues arising from the transboundary nature of many ecosystem service flows in China, which cross both important jurisdictional (e.g., provincial, municipal) and administrative borders (e.g., the overlapping administrative purviews of SEPA, the Ministry of Agriculture, the Ministry of Water Resources, the Ministry of Land Resources, the State Forestry Administration, etc.).

Another important benefit of this process is the stimulation of decentralized, local initiative, experimentation and innovation in developing feasible and cost effective methods to restore, protect and provide important ecosystem service flows. Local input in this process will be critical for determining what types of tools will work best in what situations. Though central policy often implicitly makes allowances for variations in local interpretation and implementation, greater local consultation and decision-making in environmental initiatives can be explicitly encouraged and accelerated, since this will help to improve design and ensure success.

Finally, the enabling and fostering of private sector involvement and investment in environmental protection and restoration is also an important outcome. The private sector remains an untapped yet potentially significant source of innovation and financial support for environmental initiatives in China. By creating cross-sectoral platforms for dialogue and information sharing, private sector buyers of ecosystem services can be better identified and brought into the process of developing these markets.

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