Working Paper

The Conditions for Effective Mechanisms of Compensation and Rewards for Environmental Services

Brent Swallow, Beria Leimona, Thomas Yatich, Sandra J. Velarde and S. Puttaswamaiah

World Agroforestry Centre
TRANSFORMING LIVES AND LANDSCAPES

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IDRC International Development Research Centre
CRDI Centre de recherches pour le développement international

The World Agroforestry Centre (ICRAF) and a diverse team of partners were tasked by the International Development Research Centre (IDRC) to contribute to the conceptualization and development of their Rural Poverty and Environment (RPE) programming related to Compensation and Rewards for Environmental Services (CRES) by providing an overview of relevant developments in Africa, Asia and Latin America, a global synthesis of results and recommendations. Truly global in nature, the CRES Scoping Study was undertaken by the following partners and collaborators based in 7 countries across 4 continents.

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Abstract

This is the 7th paper in a series of 9 papers prepared as part of the pan-tropical scoping study of compensation and rewards for environmental services: the conceptual framework (ICRAF Working Paper 32), 5 issue papers (ICRAF Working Papers 36, 37, 38, 39, 40) and 3 workshop reports (ICRAF Working Papers 33, 34, 35).

This paper considers the conditions that determine the effectiveness of compensation and reward mechanisms. The paper takes deductive and inductive approaches to addressing the question. A series of 11 hypotheses are derived from theories of institutional change, environmental policy diffusion, and the co-dependence between different types of policy instruments. Eight case studies, all of which were considered at regional workshops on compensation for environmental services, are reviewed in the latter part of the paper. The cases, from Latin America, Africa and Asia, cover a range of environmental services and policy contexts. Overall the results suggest the following conditions to be important in many of the cases: (1) market opportunities and localized scarcity for particular environmental services; (2) international environmental agreements, international organizations, and international networks; (3) government policies and public attitudes toward government environmental responsibility, security of individual and group property rights, and markets; and (4) the strength of the regulatory regime affecting the environment.

Keywords

Environmental services, Africa, Asia, Latin America, Kenya, Ecuador, South Africa, Philippines, Nepal, Uganda, India, institutional change, watershed services, carbon sequestration, ecotourism, payments for environmental services, ecosystem services, international environmental agreements, environmental policy.

Preface

From the beginning of 2006 until March 2007, the World Agroforestry Centre (ICRAF) led a consortium of organizations and individuals from around the world in a pan-tropical scoping study of Compensation and Rewards for Environmental Services (CRES). The scoping study was commissioned by the Rural Poverty and Environment Programme of the International Development Research Centre of Canada (IDRC) to identify critical issues affecting the development, operation, impacts and institutionalization of mechanisms linking beneficiaries of ecosystem services with stewards of those ecosystems. Particular attention is paid to the potential for CRES to alleviate or exacerbate the multiple dimensions of poverty: rights to productive assets, streams of income and consumption, and vulnerability to shocks.

The scoping study included a series of regional workshops held in Latin America (Quito, Ecuador), Asia (Bangalore, India) and Africa (Nairobi, Kenya). Participants presented and discussed practical CRES experiences from across the developing world, experiences which informed and challenged the development of several cross-cutting issue papers. A series of nine working papers have been prepared to summarize the results of the scoping study, including an introductory paper, three regional workshop reports, and five issue papers on key topics.

ICRAF Working paper 32 – Compensation and Rewards for Environmental Services in the Developing World: Framing Pan-Tropical Analysis and Comparison.

ICRAF Working paper 33 – Report on the Latin American Regional Workshop on Compensation for Environmental Services and Poverty Alleviation in Latin America.

ICRAF Working paper 34 – Asia Regional Workshop on Compensation for Ecosystems Services. A component of the global scoping study on compensation for ecosystem services.

ICRAF Working paper 35 – African Regional Workshop on Compensation for Ecosystem Services (CES).

ICRAF Working paper 36 – Exploring the inter-linkages among and between Compensation and Rewards for Ecosystem Services (CRES) and human well-being: CES Scoping Study Issue Paper no. 1.

ICRAF Working paper 37 – Criteria and indicators for environmental service compensation and reward mechanisms: realistic, voluntary, conditional and pro-poor: CES Scoping Study Issue Paper no. 2.

ICRAF Working paper 38 – The conditions for effective mechanisms of Compensation and Reward for Environmental Services (CRES): CES Scoping Study Issue Paper no. 3.

ICRAF Working paper 39 – Organization and governance for fostering pro-poor Compensation for Environmental Services: CES Scoping Study Issue Paper no. 4.

ICRAF Working paper 40 – How important will different types of Compensation and Reward Mechanisms be in shaping poverty & ecosystem services across Africa, Asia & Latin America over the next two decades? CES Scoping Study Issue Paper no. 5.

The working papers are designed for relatively limited circulation of preliminary material. We anticipate that all of the papers will be revised and published in a formal outlet within the next year.

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Contents

1. Introduction

It is becoming increasingly clear that current patterns of human-environment interaction are causing increasing strain on the world's ecosystems. The Millennium Ecosystem Assessment (MA) (2005) recently concluded that most of the world's ecosystems have already suffered major degradation. Ecosystem degradation is evident in most parts of the world, including both more and less developed economies.[1] Many types of economic activity and production are degrading to the environment: more agrarian economies are more prone to the problems of declines in soil fertility and sedimentation of waterways, while more industrialized economies suffer more from problems such as air and nitrate loading of waterways. Global climate change ties together both rich and poor countries.

Over time, human societies have evolved different institutional arrangements to counter these problems, with institutions formed at the local, national and global levels. For the most part, these institutions focus on regulation of individual behaviour, protecting public rights to certain resources or ecosystems, and undertaking collective investment in infrastructure to harness the benefits derived from ecosystems. There are some remarkable successes with these institutions, including the Montreal Protocol on ozone-depleting substances at the international level and the Baltic Sea Initiative at the regional level. Another approach that is gaining prominence in many parts of the world is to develop more flexible instruments, including voluntary and conditional payments or rewards for environmental services (ICRAF Working Paper no. 32).

As part of a pan-tropical scoping study of compensation and rewards for environmental services (CRES), this paper presents and supports hypotheses about conditions affecting the effectiveness of mechanisms of compensation and reward for environmental services. The 'conditions' considered in this paper set the context for any particular CRES mechanism; the paper by Bracer et al. (ICRAF Working Paper no. 39) in turn considers internal organizational and governance issues that define the workings of particular mechanisms. This paper adopts the definitions provided by Swallow et al. (ICRAF Working Paper no. 32). Rewards for environmental services are market, payment and incentive schemes that reward actors who conserve (a guardian role) or restore (a stewardship role) the regulating, cultural and support services provided by terrestrial, freshwater and marine ecosystems. These rewards are provided by entities that benefit from the provision of environmental services, or representatives of those entities. Compensation for environmental services are payment or transfer schemes made to the users of ecosystem services for declines in the quantity or quality of those services. Compensation is provided by other beneficiaries of the services, entities expected to be guardians of those services, or representatives of those two groups.

A key concept in this paper is 'effectiveness' of institutions for compensation and rewards for environmental services. A standard assessment of effectiveness might consider the outcomes regarding degradation or restoration of ecosystem structure, function and services, and the efficiency with which those outcomes are achieved (e.g. Ferraro and Kiss, 2002). An additional concern for many of the organizations involved with environmental conservation and sustainable development in the developing world is the impact on human well-being, particularly for poor

[1] There is evidence of an inverted U relationship between income and degradation for pollutants associated with economic growth, such as SO_4 and hydro-flurocarbons, with degradation rising, leveling off, and eventually falling with increases in income. Other studies have shown that this relationship is not evident for all forms of pollution or degradation (Cole, Rayner and Bates, 1997; Stern, 2004). More information on the links between human well-being and ecosystem services is presented in Uftikhar (ICRAF Working Paper no. 36).

and vulnerable groups.[2] The hope is that institutions for compensation and reward for environmental services can be purpose-built to be beneficial to social groups who have been marginalized by other social institutions (Iftikhar et al. ICRAF Working Paper no. 36). Following Van Noordwijk et al. (ICRAF Working Paper no. 37), we measure effectiveness by the four criteria of realistic, voluntary, conditional and pro-poor. For this paper we consider the following issues:

The paper takes both inductive and deductive approaches. The deductive approach applies principles of new institutional economics and political economy, examining compensation and reward schemes as institutional and policy innovations. The inductive approach presents evidence from case studies in which compensation and reward schemes have been put in place in particular parts of Africa, Asia and Latin America. In addition, the paper draws upon deliberations at the CRES scoping study regional workshops in Asia, Africa and Latin America. One of the unique attributes of the scoping study was the global approach: drawing lessons from Africa, Asia, Latin America and other environments where Compensation for Environmental Services (CES) and Rewards of Environmental Services (RES) mechanisms have in place for longer periods of time.

To set the scene for the remainder of the paper, we offer two propositions:

> **P1.** Mechanisms of compensation and reward for environmental services are most likely to be effective where: (1) local conditions create effective demand for CRES mechanisms; (2) national and international conditions are supportive of CRES mechanisms; and (3) there is active and effective diffusion and promotion of CRES mechanisms by credible intermediary organizations.
>
> **P2.** Mechanisms of compensation and reward for environmental services are most likely to emerge during periods of social, economic and policy adjustment to new social expectations.

Section 2 of this paper presents theoretical support to those propositions, while section 3 presents empirical support drawn from case studies presented at the regional workshops.

2. Theoretical Foundations

P1 suggests three sets of conditions determining the effectiveness of CRES mechanisms: (1) local conditions of supply and demand for CRES mechanisms to mediate relations between ecosystem stewards and environmental service beneficiaries; (2) national and international conditions shaping the local context and determining the potential of alternative environmental policy instruments; and (3) conditions for the cross-country replication or dissemination of CRES mechanisms. In this section we review some of the social science theory that can help us to identify conditions that are favourable or unfavourable to CRES mechanisms.

Several theories have been developed to explain changes in the institutions and policies that human societies put in place to provide order and security in inter-personal relations. Economic

[2] For example, since 2003 the International Fund for Agricultural Development has financed the development of a pilot programme on rewarding the upland poor for environmental services (RUPES) (www.worldagroforestrycentre.org/sea/themes/rupes). In 2005 the United Nations Environment Programme convened a high-level and expert-level international workshop on Pro-poor markets for ecosystem services at the London School of Economics. IDRC is interested in how research on compensation and rewards for ecosystem services can help meet the objectives of its Rural Poverty and Environment Programme.

theories of institutional and policy change have been particularly applied to explain changes in property rights to things like land and water, while public choice theories have been applied to understand change processes for a wider range of market and governance institutions. Looking through the lens of institutional change theory, we see that many of the mechanisms for compensation and reward for environmental services can be seen as combinations of property rights and market institutions. CRES mechanisms help to internalize externalities through the creation of more secure and individualized property rights in environmental services and conditions for the transfer of those rights among and between ecosystem stewards and environmental service beneficiaries.

The theory of institutional change can be distinguished into two streams of thought: endogenous institutional and policy change and institutional diffusion between policy contexts. Section 2.1 reviews the economic theory of institutional change, while section 2.2 considers the political science theory policy diffusion. Section 2.3 presents theory and evidence on the international diffusion of environmental policy instruments.

2.1 Economic theories of institutional change

Demsetz (1967) was one of the first economists to study institutional change, developing a demand-led model of institutional change. That theory revolves around the concept of externality: the unintended effects of one person's actions on other people's welfare. The theory postulates that societies will decide to develop more secure property rights institutions when there is a great enough need to internalize externalities from each other's use of resources (Demsetz, 1967; Hayami and Ruttan 1985). Changes in the scarcity of inputs, new technologies available to transform inputs into outputs, and new output markets are thus hypothesized to be key factors prompting changes in the value of property rights institutions. This theory suggests that the following factors will be important drivers of the development of institutions for compensation and reward for environmental services:

> **H1.** Increased scarcities of environmental services, due to population growth, demographic shifts, and / or degradation of the ecosystem, will prompt increased demand for restoring and protecting ecosystems, which will in turn prompt greater demand for secure and tradeable property rights to environmental services.
> **H2.** The availability of profitable new technologies for using environmental services to generate economic outputs will translate into increased demand for environmental services and thus more secure and tradeable property rights for environmental services.
> **H3.** New market opportunities for selling environmental services or outputs generated by those services will prompt increased demand for environmental services, new demand for compensation for resulting damage to ecosystems, and thus new demand for CRES institutions.

The demand-driven model of institutional change assumes that all property rights changes are self-induced within a particular society, that political institutions respond to opportunities to enhance the welfare of their citizenry, that institutional change is an incremental change process, and that institutional change is relatively costless to society and its members. Recognizing these over-simplifications of the demand-led theory, subsequent theories and models have given more consideration to the supply of institutional change and the differences among groups of people that prompt them to demand different institutions. North's (1994) political economy theory of institutional change recognizes: that people and organizations are motivated to promote institutional change in order to gain economic returns; that they tend to coalesce into political interest groups in order to further those interests through reform of existing institutions or creation of new institutions; and that institutional change is a costly process for individuals who

engage in the process and for the social entities responsible for implementing the institutions. Changes in institutions that result from these processes are therefore highly path-dependent, with institutional arrangements in one period having great influence on the types of changes that occur in subsequent periods. The interest group model of institutional change supports additional hypotheses about the drivers of CES and RES institutional change:

> **H4.** The development a CES or RES mechanism occurs in the context of a number of other rural institutions and interest groups, many of which directly affect the formation of interest groups, the transaction costs of institutional change, and the public choice process through which choices are made.
>
> **H5.** Individual ecosystem stewards and environmental service beneficiaries in favour of RES or CES mechanisms will form coalitions to further their interests. These interest groups will tend to exclude the poorest and most vulnerable members of society.
>
> **H6.** Organizations that serve as intermediaries between ecosystem stewards and beneficiaries have their own objectives, which may align with one or another de facto interest group with the stewards and / or beneficiaries.

2.2 Political science models of institutional change

Jordan et al. (2003) identify three political science models of institutional change: (1) ideas dominant; (2) settings dominant, and (3) chaos dominant. They apply those models in an assessment of environmental policy change in Europe and Australia. The models may have similar relevance for an analysis of CRES mechanisms in the tropics.

The *ideas dominant model* originates in the public policy literature. It assumes that large and small policy changes occur as a result of social learning in which groups of policy actors exert influence over the policy process to further their own beliefs through the promotion of policy instruments that are consistent with those beliefs. Most policy changes occur as minor changes to existing policies, with occasional major shifts. The ideas dominant model is similar to the North (1994) model described in section 2.1, with North putting more emphasis on economic gain as the main driver of political interests, and the ideas dominant model considering a wider basis for people's beliefs. Following the ideas dominant model, the development of CRES mechanisms might be regarded as a major or minor policy change, depending upon pre-existing policies and social norms regarding property rights and environmental regulation.

> **H7.** CRES mechanisms are more likely to emerge and be effective where market and property rights institutions are most functional and engrained in people's beliefs about a fair and just society.

The *settings dominant model* argues that the political context of policy change is crucial for informing the choices of decision-makers. "*The whole range of state and societal institutions … shape how political actors define their interests and … structure their relations of power to other groups*" (Thelen and Steinmo, 1992, quoted in Jordan et al., 2003, p. 560). In a setting dominant context, environmental policy primarily depends upon the broader institutional context. Changes to environmental policies will be incremental, with significant changes only if major environmental catastrophes occur. CRES mechanisms may only emerge as a policy response to an environmental disaster that is understood to be due to ineffective command-and-control policies.

> **H8.** The development and operation of CRES mechanisms may be ineffective if the mechanisms are perceived to be inconsistent with social values related to the environment, markets, and / or property rights.

The *chaos dominant model* views the policy process as unstable because preferences are unclear for actors who operate under conditions of uncertainty and who lack the time for comprehensive searches for information. At any time, an unpredictable assortment of ideas, approaches and

decision-making priorities is present in the policy making process, with little systematic pattern emerging. Kingdon (1984, referenced in Jordan et al., 2003) developed a particular variant of the chaos dominant model. He proposed that the policy process contains three streams: (1) a stream of problems demanding policy solution; (2) a stream of available policies that are not specific to particular policy problems; and (3) a stream of politics where actors compete for position and resources, shaping how policies are defined and solutions selected. Interactions between the streams create *policy windows* in which a compelling problem forces political recognition and opens an opportunity for a specific policy solution to seize the agenda. Policy entrepreneurs can take advantage of these windows to push particular policies. Large or small policy changes can occur without systematic changes in the policy environment. Viewed through the lens of the chaos dominant model, CRES mechanisms may be adopted quickly if a suitable policy window opens and a political entrepreneur is present to take advantage and promote the policy change.

> **H9**. CRES mechanisms may emerge at unexpected times and situations, and may be strongly associated with the activities of particular individuals or organizations that are able to spot suitable policy windows and advocate for them.

Table 1 presents an overview of the five models of policy change described in section 2.1 and 2.2 above. It also summarizes the implications for the development and effectiveness of CRES mechanisms.

Table 1. Five models of policy and institutional change and implications for CRES

	Demand-driven	Political economy	Ideas dominant	Settings dominant	Chaos dominant
Themes	Mechanisms will develop if there is sufficient demand	Demand and supply conditions are driven by economic motivations of dominant interest groups.	Policy choice driven by conflict between competing ideas	National institutions and ideologies shape selection and implementation processes	Instruments look for policies; policies look for instruments
Role of policy instruments	Maximizing economic benefits to society	Maximizing returns to dominant interest groups	Mainly instrumental; implement dominant ideas / approaches	Embedded in institutional setting which shape the policy development / search process	Search process is ad hoc (whatever appears to work)
Key agents of policy change	Political decision makers	Political decision makers responding to powerful interest groups	Expert communities; advocacy coalitions; experts and scientists	National and / or supranational actors within the institutional structures	Pluralistic mix of actors
Search process	Rational	Rational, but path dependent	Rational and goal directed	Path dependency (to achieve goodness of fit)	Chaotic and highly pluralistic
Scope for effective CRES mechanisms	Depends upon supply and demand for ecosystem services and success of command-and-control institutions	Depends upon strength and motivations of different interest groups	Depends upon how the idea is marketed vis-à-vis other ideas.	Small if CRES mechanisms do not fit with prevailing norms on environment, markets and property rights; large if CRES mechanisms do fit those norms	Difficult to predict

Source: Modified and expanded from Jordan et al. (2003), p. 559.

2.3 Global diffusion and convergence of environmental policy

The five models of endogenous institutional development summarized in Table 1 are all based on the assumption that institutional change is fully determined within the context of a particular society. An implication of those models is that there will be large variation between societies in the state of their institutions and institutional change pathways. However, multi-country studies of environmental policy show a remarkable convergence across countries, particularly among the countries of the Organization for Economic Cooperation and Development (OECD), but also including many developing countries in Latin America, Asia and Africa. This policy convergence can be partly explained by the development of multi-lateral environmental agreements (MEAs) that place new expectations and demands on national governments. In addition, it is clear that there has been rapid diffusion of environmental policy instruments from frontrunner countries to others.

Kern, Jörgens and Jänicke (2001) propose that countries enact new environmental laws in response to domestic pressures and debate, in anticipation of opportunities for international trade and international leadership, and as a result of support from international networks or organizations. They note, for example, that countries like Denmark, Sweden and the Netherlands often claim in official publications to be the frontrunner in environmental policy. Prime Minister Tony Blair recently claimed that he would continue to lead on addressing climate change. Besides international prestige, many countries that take frontrunner status in particular environmental policies are also the main exporters of environmental technologies (e.g. Germany, Japan, the United States), implying a supply push from industry. By adopting stricter controls on greenhouse gas emissions, the companies and national governments of Europe are now hoping to gain competitive advantage in 'clean' technologies relative to the United States and China (informal interviews with industry leaders attending the UNFCCC meeting in Nairobi, December 2006). Latecomers to the adoption of new environmental policies may face significant adjustment costs.

The OECD seeks to foster the diffusion of innovative policies through the documentation and broad publication of national best practices. The OECD's influence on environmental policies is enhanced through the publication of national-level Environmental Performance Reviews. Since the early 1980s, the OECD has published Environmental Performance Reviews of almost all member countries. These reports, which explicitly address inadequacies in national policy frameworks, are taken very seriously by member countries. In New Zealand, for example, the announcement of an upcoming Environmental Performance Review by the OECD prompted the government to urgently pass a backlog of previously blocked environmental policies and laws (Bührs, 1997, referenced in Kern, Jörgens and Jänicke , 2001). In 2006, the OECD published its 10-year Environmental Policy Review of the United States in which they concluded that "… *the US still faces challenges with respect to high energy and water intensities, environmental health risks, marine habitat conservation and maintenance of biodiversity. There remains much potential to integrate environmental concerns through market-based instruments, particularly in the energy, transport and agriculture sectors. To meet these challenges, it will be necessary for the United States to i) thoroughly implement its environmental policies, improving their cost effectiveness and inter-jurisdictional co-ordination; ii) further integrate environmental concerns into economic and sector decisions; and iii) further develop international environmental co-operation"* (OECD, 2006).

The OECD is a lead organization in reviewing and assembling best practice on the use of CRES mechanisms among its member states and beyond. The organization has recently published reports on *Voluntary Approaches for Environmental Policy* (OECD, 2003a), *Implementing Domestic*

Tradeable Permits (OECD, 2002), *Tradeable Permits: Policy Evaluation, Design and Reform* (OECD, 2004), and *The Use of Tradeable Permits in Combination with Other Environmental Policy Instruments* (OECD, 2003b), and *Nutrient Trading: A Water Quality Solution* (OECD, 2005). A variety of United Nations agencies are also providing support for the adoption of effective CRES mechanisms, particularly the World Bank, the Global Environment Facility, and the United Nations Environment Programme. Other organizations involved in promoting CRES mechanisms through research, training and policy support in the developing world include Forest Trends, the World Agroforestry Centre (ICRAF), the World Conservation Union (IUCN), the International Institute for Environment and Development (IIED), Care International and the Worldwide Fund for Nature (WWF). Two important networks are the Katoomba Group and RUPES.

> **H10.** CRES mechanisms are more likely to be effective if they are consistent with national level and well-supported by international organizations and networks.

2.4 CRES mechanisms in the context of social expectations and regulations

Swallow et al. (ICRAF Working Paper no. 32) presented a model of the dynamics of environmental policy vis-à-vis community preferences. The source of the model was Hattfield-Dobbs (2006), adapted from Young (2003). That model illustrates that the space for CRES mechanisms is defined by the combination of social expectations and the regulations that define mandatory standards of care. Young presumes that community preferences for environmental regulation increase over time, due to increasing scarcity of ecosystem services and increasing income, with a lagged response by environmental regulations. The time lag creates space, or a window of opportunity, for CRES mechanisms. As regulations catch up with community expectations, this window will close. Best practice in CRES mechanisms may become the standard of performance mandated in new environmental regulations. See Figure 1 for a depiction of this situation.

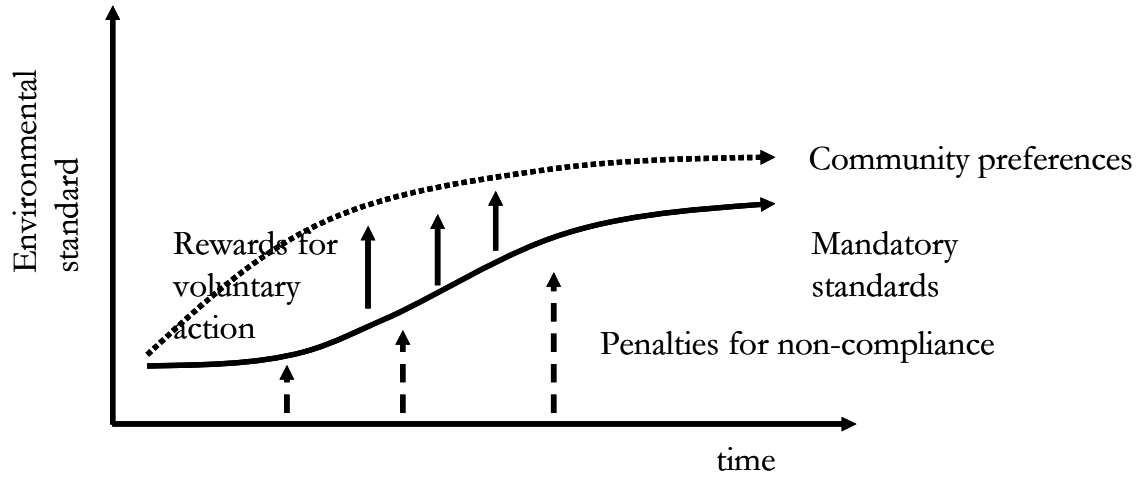

Figure 1. The policy window for CRES mechanisms as defined by lag relationships between community preferences and penalties

From the review presented by Swallow et al. (ICRAF Working Paper no. 32), however, it appears that governments and societies are actually expecting more and more of CRES mechanisms, in some cases contracting the scope of environmental regulation. King (2005) argues that clear and strongly enforced government regulations are actually a pre-condition for operation of CRES mechanisms. King supports this hypothesis by comparing the successful case of the SO_2 emission trading, where emission limits are strictly enforced, with the relatively unsuccessful water quality trading, where maximum water pollution loads are neither so clearly nor so tightly enforced. Where regulation is shrinking at the same time that communities are demanding greater environmental regulation, it is possible that the scope of effective CRES mechanisms will actually decrease, creating a larger and larger performance gap. This may partially explain why the OECD (2006) was so critical of the recent environmental policy performance of the United States: declining regulatory capacity is reducing the space and effectiveness of CRES mechanisms (see Figure 2).

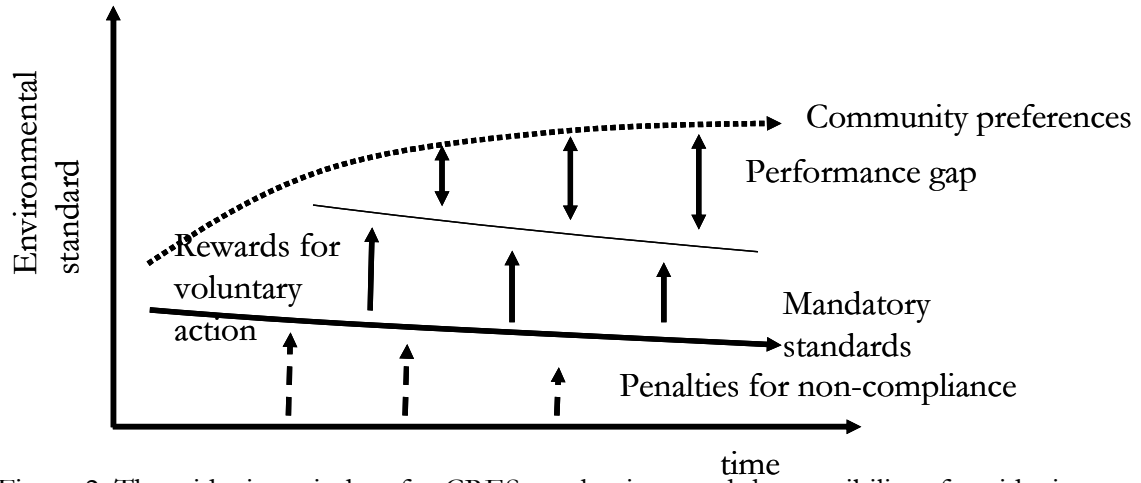

Figure 2. The widening window for CRES mechanisms and the possibility of a widening performance gap

H11. CRES mechanisms are likely to be most effective where governments allow space for voluntary mechanisms, but less effective where governments expect CRES mechanisms to replace regulations.

3. Review of case study evidence from the global scoping study

The Pan-tropical Scoping Study of Compensation for Environmental Services included regional workshops convened in Latin America (Quito, Ecuador, April 2006), Asia (Bangalore, India, May 2006), and Africa (Nairobi, Kenya, May 2006). The results of those workshops are summarized in proceedings documents edited by Poats (– ICRAF Working Paper no. 33), Raju et al. (ICRAF Working Paper no. 34) and Ochieng, Otiende and Rumley (ICRAF Working Paper no. 35). A range of specific CRES mechanisms were presented and discussed at those regional workshops. This section of the paper reviews some of the case studies, looking for conditions that appear to have been particularly important in shaping the effectiveness of the mechanisms. Some of the case studies are relatively mature, and very well documented, while others are still in the formative stages, often with relatively little documentation. The case studies are all presented according to a common framework: context, negotiation, implementation, and key conditions for effectiveness. The effectiveness of the mechanisms will be judged relative to the scoping, negotiation and implementation stages, using indicators suggested by the papers by Van Noordwijk et al. (ICRAF Working Paper no. 37).

3.1 Case Study 1: Mechanisms for water and forest protection in Gonzanama and Quilanga, Ecuador [3]

Context.
A payment for watershed services scheme has recently been established in two micro catchments in the neighbouring municipalities of Gonzanama and Quilanga in the southern Andes of Ecuador. The Chorrera / Altashina catchment in Gonzanama covers 9 km^2, 35% of which is natural forest and 27% of which is pasture. The main economic activity is extensive cattle ranching and some subsistence agriculture. The San Pedro / Aminduro catchment in Quilanga covers 7 km^2, which is covered by a mosaic of pastures, patches of natural forest, crops and others. The main economic activities are extensive cattle ranching and agriculture (maize, peas and beans). There are approximately 1900 water users in Gonzanama and 700 in Quilanga. The total water supply in Gonzanama is more than adequate to meet current needs, while Quilanga will soon need to identify new water sources to meet its needs.

Scoping and negotiation:
Both municipalities have a history of participation on environmental projects. In 2000, the Food and Agriculture Organization, Fundacion Futuro (a local non-governmental organization) and the Municipality of Gonzanama raised awareness on the environment, which resulted in the creation of the Environmental Management Unit (EMU). In 2001-02, a project on biodiversity conservation was initiated. A followup project on payments for watershed services began in 2003-05, with support from the Regional Program for Andean Native Forests (PROBONA), the Swiss Cooperation, and the Netherlands Development Organisation (SNV). The project went

[3] *Sources*: 1. Matamoros, 2005. Mecanismos alternativos para la protección de agua y bosques. Una propuesta diferente para la compensación por servicios ambientales. Fundación Futuro. Loja, Ecuador. 2. Rojas, J. 2006. Gonzanamá and Quilanga, Payments for environmental services cases submitted to the IDRC scoping study, Ecuador inventory. 3. Rojas, J. (Personal Communication, 09 June 2006).

through the normal stages of scoping, negotiation, implementation and evaluation, with relevant organizations involved along the way. The municipal governments were particularly supportive and proactive.

The scoping and negotiation phases helped to identify: 1) alternative institutional mechanisms for managing payments for environmental services; 2) priority areas for maintaining water quality and stream flow; 3) economic values of potable water; and 4) geographical areas of greatest hydrologic importance. The scoping and negotiation phases resulted in a watershed management plan at the general and specific farm level, a municipal decree on payments for watershed services, and individual contracts between the municipality and each farmer in the area. Individual contracts provide farmers with tax exemptions on property and water, and technical assistance for cattle ranching and coffee production. Part of the overall scheme includes awareness raising through schools and civil society.

Conditions determining effectiveness:

1. A small area with a history of successful environmental management.
2. A pro-active municipal government and open dialog among all stakeholders.
3. Individual farm contracts include combined action toward conservation (forests and water resources), support for production (coffee, cattle), education (schools, civil society) and policy (municipal empowerment and law).
4. Negotiations take account real interests from participants: water supply, land tenure security, production and commercial interests, awareness raising, control and monitoring systems.

3.2 Case Study 2: South Africa's Working for Water Programme [4]

Context:

Nearly 9000 plant species have been introduced to South Africa over the past 500 years, with 1000 of those species becoming naturalized, 200 of which are invasive. Invasive alien species have become established on over 100,000 km^2, approximately 10% of the total land area of the country. Invasive alien species use 7% of all water resources, reduce the ability to farm, intensify flooding and fires, cause erosion and siltation, and threaten biological diversity. The overall cost to the South African economy is estimated to be greater than US$10billion.

Scoping and negotiation:

A strong base of information was developed on the ecological, hydrologic, social and economic impacts of invasive alien species over many years. In 1995 the Working for Water programme was initiated to address the problem. The Programme is administered through the Department of Water Affairs and Forestry. This programme works in partnership with local communities, to whom it provides jobs, and also with Government departments including the Departments of Environmental Affairs and Tourism, Agriculture, and Trade and Industry, provincial departments of agriculture, conservation and environment, research foundations and private companies.

Implementation:

Since its inception the Working for Water Programme has cleared more than 10,000 km^2 of invasive alien plants (10% of the degraded area), each year providing jobs and training to approximately 20,000 people from among the most marginalized sectors of society. Of these, 52% are women. The Working for Water Programme currently runs over 300 projects in all 9 of

[4] Sources: a) Ahmed Khan, presentation at the African Regional Workshop on Compensation for Ecosystem Services, World Agroforestry Centre, Nairobi, Kenya, May 2006. http://www.dwaf.gov.za/wfw/.

South Africa's provinces. Funds for the programme are generated through a water resource management fee added to water bills.

Conditions for effectiveness:

1. Clear demonstration of an environmental problem worthy of national-level government involvement, with specific action concentrated in areas of greatest need and where local governments are willing to pay.
2. Linking environmental management with the national priorities for rural employment generation and poverty reduction.
3. Rights and negotiation context. The Government of South Africa considers water a national resource, and has sophisticated infrastructure for moving it around the country. Reducing water waste, as is done in the Working for Water programme, therefore is seen as a national-level issue.
4. Maintenance of a research capacity in control methods, hydrology, ecology, economics and social science, with research results used to update and revise the programme.

3.3 Case Study 3: Rewards for watershed services in the Bakun watershed in the Philippine uplands

Context:

The Bakun watershed in the Northern Philippines is a 310 km^2 area in the Cordillera mountains. The watershed is the home for the Bago and Kankana-ey people, indigenous minority groups. Poverty is severe, with about 87% of people living below poverty line and 90% of people dependent on smallholder agriculture. Bakun is the source of domestic and irrigation water supply for the local community and the operation of two hydropower companies. Sources of information for this brief are Espaldon (2005) and the RUPES Bakun Site Profile[5].

The long colonial history of the Philippines has shaped its institutions for land tenure and natural resource management. When it first colonized the Philippines 400 years ago, the Spanish colonial government forcefully took control of local resources from the indigenous people living in upland areas like Bakun. This doctorine continues to influence the country's laws even 400 years after the Spanish colonial rule ended in the Philippines. The American colonial government imposed the Public Land Act of 1902 which legalized the entry of large-scale logging companies into the uplands. Presidential Decree 705 (issued under the Marcos Administration 1965-1986) stipulated that all lands with slopes greater than 18 degrees belonged to the State as forest reservations. This included the homelands of the Bago and Kankana-ey people in the Bakun watershed. In 1995, a new Philippine Mining Act liberalized the mining industry, and two mining companies entered the Bakun area to establish mines on former family land and clan-managed woodlots.

In 1993, the new Philippine Constitution finally instituted state recognition of the rights of indigenous people to their ancestral domain and ancestral lands. As the follow up, the Department of Environment and Natural Resources (DENR) issued two new policies paving the way for the issuance of Certificates of Ancestral Land Claim (CALC) and Certificates of Ancestral Domain Claim (CADC). Later in 1997, the Indigenous Peoples Rights Act was passed which reinforced legal recognition of ancestral land claims and ancestral domain claims. The National Commission on Indigenous Peoples was created to implement the law. Taking advantage of this new legal environment, the Bago-Kankana-ey people of Bakun organized the

[5] The Bakun case was reviewed as part of a presentation of the RUPES programme at the Asia Regional Workshop for the Pan-tropical Scoping Study of Compensation for Ecosystem Services http://www.worldagroforestrycentre.org/sea/networks/rupes/download/SiteProfiles/RUPES-Bakun_FINAL.pdf

Bakun Indigenous Tribes Organization (BITO) as the key organization to facilitate their ancestral domain development and protection efforts. In 2002, the Kankana-ey was the first indigenous group to obtain a Certificate of Ancestral Domain Title (CADT) which gives the tribe formal title to its traditional lands.

Scoping and Negotiation:
At approximately the same time as indigenous people's rights have gained greater recognition, the Republic Act and Energy Regulation has been passed in the Philippines, mandating power companies to contribute part of their taxes to a development and livelihood fund and an environment enhancement fund. While the two power companies in Bakun have complied with the law, this did not immediately lead to effective watershed management in Bakun.

With support from the RUPES Programme, BITO facilitated the establishment of an integrated watershed management programme with direct participation of the local people. Facilitated negotiations between BITO, the power companies and the municipal government have aimed at using the portion of royalties from hydropower production for environmental enhancement to support conservation efforts by local communities. This has been a first step toward conditional payments, however a clearer 'business case' for the potential buyers of the watershed services needs to be developed. Locally-agreed criteria and transparent mechanisms will make the redistribution of royalties more effective in gaining environmental services outcomes. As one of the next steps, the government officials and BITO still need to reach an understanding on the complementary roles they can each play in rewards for environmental services for Bakun. In addition, further clarification of issues of rights and resources within the national policy framework needs aligning with the issuance of the Bakun CADT.

Conditions determining effectiveness:

1. Valuable environmental services: The presence of the two hydro-power companies shows the importance of the watershed services. However, there still is insufficient clarity about of the business case for investment in watershed services by the hydro-power companies.
2. Rights and negotiation context: The new empowerment of indigenous groups in the Philippines has enhanced the bargaining power of the indigenous groups who live in the community. Formulation of the BITO brought the two ethnic groups together to negotiation as a single, more powerful, voice. The effectiveness of BITO is still limited by the slow implementation of the CADT.
3. Regulatory underpinnings: The Energy Regulation act ensures that some of the taxes paid by hydro-power companies are earmarked for catchment conservation.
4. Political will: The Municipality government is willing to allocate a portion of royalties from general municipality budget to the Bakun people for watershed management in enhancing environmental service functions.
5. Role of policy support networks. Bakun is one of 6 core sites in the RUPES programme: Rewarding the Upland Poor of Asia for Environmental Services they provide. RUPES is coordinated by the ICRAF office in S.E. Asia, with a country representation in the Philippines that facilitates national network on environmental services (PES TEC – Payment for Environmental Services Technical Committee) and multi-stakeholder Technical Advisory Group at local level.

3.4 Case Study 4: Compensating Upland Communities for watershed services in the Kulekhani Watershed, Nepal [6]

Context:
The Kulekhani Watershed is located in Makwanpur district of Nepal. The watershed covers an area of about 125 km^2 and is inhabited by about 45,000 people in 8500 households. The Kulekhani River and its tributaries, Sim, Pakhel, and Chitalang, originate from the watershed. In the early 1980s, a dam was constructed across the rivers to generate hydroelectric power. The first power station started functioning in 1982 and the second in 1985. The power stations are operated by the Nepal Electricity Authority, a para-statal organization.

High sedimentation rates were noticed soon after the power stations opened, apparently linked to deforestation and the dam construction itself. Later in the 1980s, the government and donor agencies initiated afforestation activities with support from the local population. Studies show that these efforts have resulted in reducing the sedimentation rate and increasing dry-season water flow.

The Electricity Act of 1992 requires the Nepal Electricity Authority (NEA) to pay a portion of its electricity revenue as royalties to the central government. The 1999 Local Self Governance Act (LSGA) and Local Self Governance Regulations (LSGR) require the central government to allocate a share of its hydropower royalty to district governments where hydro-electricity plants are located. This share has increased over time, with the second amendment to the LSGR requiring the central government to allocate 38% of its hydropower royalty to the 19 district governments of the districts that host hydropower plants.

Scoping and Negotiations:
With support from the RUPES Programme, Winrock-Nepal has been trying to build a RES scheme for this watershed area. They have encouraged farmers living in the Kulekhani watershed to mobilize for collective action and created awareness and negotiation skills among the upland communities. The communities formed the Kulekhani Watershed Conservation and Development Forum – a local institution representing environmental service providers within the Kulekhani watershed.

Winrock-Nepal has been exploring different mechanisms to provide rewards to the suppliers of environmentals services of the Kulekhani watershed area from the beneficiaries. It is proposed that 20% of the hydropower royalty received by the Makwanpur District Development Committee (DDC) be earmarked for conservation of the upland watershed. This royalty would be transferred to a 'Environment Management Special Fund' (EMSF), which would be managed by a committee comprised of local stakeholders including ecosystem stewards and environmental service beneficiaries. The upland communities need to identify the development and conservation works of the watershed, which the committee would fund after scrutinizing the proposals.

Conditions determining effectiveness:
1. Valuable environmental services: The presence of the hydro-power companies shows the importance of the watershed services.
2. Small-sized catchment (125 km^2), with a relatively high population density, means that the threats to the water supply are real. Average population density for the whole watershed is 360 persons / km^2.

[6] http://www.worldagroforestrycentre.org/sea/networks/rupes/download/SiteProfiles/RUPES-Kulekhani-FINAL.pdf

3. Data illustrating a link between afforestation, water quality and dry-season water availability. The smaller the catchment, the easier it generally is to illustrate cause and effect relationships.
4. Rights and negotiation context: Nepal is well known for its progressive social forestry law which gives local communities significant rights to access and manage forest resources.
5. Existence of a credible local institution: intensive social mobilization and local empowerment triggered the establishment of local forum representing the communities in managing the hydropower royalties allocated to the EMSF and fully participating in watershed management planning.
6. Regulatory underpinnings: The Electricity Act and the Local Self-Government Regulations combine to provide the context for payments to be made.
7. Political will: the transfer of hydropower royalties currently is a one-year decision and will be reviewed annually since Makwanpur DDC is a political body, any changes in the political context will influence the decisions it makes.
8. Role of policy support networks. Kulahani is another of the 6 core sites in the RUPES programme.

3.5 Case Study 5: Community-based ecotourism at Il Ngwesi, Kenya[7] [8] [9]

Context:
The Il Ngwesi Community mainly consists of pastoralists living in Kenya's Laikipia Plains, home to some of the world's greatest concentrations of large wild mammals. Il Ngwesi is a group ranch covering 165 km^2, with a population of 500 households. It is located next to the privately-owned Lewa Wildlife Conservancy. Over the years, livestock grazing pressure and inter-community conflicts over pasture have risen in Il Ngwesi. Competition between wildlife and domestic livestock for the available pasture and water have been aggravated by frequent droughts and famines.

Negotiation and establishment:
In the late 1980s, the Lewa Wildlife Conservancy began to support the Il Ngwesi community to establish itself as a high-end ecotourism destination. The Group Ranch established an exclusive 16-bed ecotourism lodge which generates revenue for biodiversity conservation (patrols that guard against poaching, overgrazing and excessive logging) and for investment in community infrastructure and services (education, infrastructure). Il Ngwesi also provides a larger wildlife dispersal area.

Operation:
In 2002, Il Ngwesi won one of the prestigious Equator Initiative awards for outstanding performance in meeting conservation and development goals. Il Ngwesi was commended for:

i) Tightly controlled grazing leading to regeneration of fauna and flora;

[7] This information is abstracted from www.lewa.org/ilngwesi_lodge.php and http://www.undp.org/equatorinitiative/equatorprize/EquatorPrize2002/awards_winners.htm#five.
[8] There may be as many as 20 other community-based eco-tourism initiatives in Kenya at present. The Kenya Wildlife Service notes three other community-based ecotourism schemes operational in Kenya's coast province: Golini Mwaluganje Community Game Sanctuary, the Shimoni Nkwiro-Kibuvuni Lagoon Preservation Project, and the Arabuko-Sokoke Forest Reserve (http://www.safariweb.com/safarimate/kws.htm). The website of Ecotourism Kenya lists 14 other community initiatives or conservation trusts (www.ecotourismkenya.org). There are many other initiatives where private investors are co-investing with rural communities (e.g. www.maasai.com).
[9] Community conservancies, funded by ecotourism revenue, have also been established in Namibia, South Africa and Zimbabwe.

ii) Developing out of lessons and partnerships built with the Lewa Conservancy. The community eco-lodge provides direct benefits to the community through jobs, and the income from the lodge is distributed to the 500 households belonging to the group ranch;

iii) Promoting innovation and transferability-" *Not only was Il Ngwesi a leader in establishing an up to now unmatched innovativeness in building an eco-lodge, but they have also entertained almost two hundred visits from other communities through out the region who are hoping to replicate the concept in their own areas*" (Equator Initiative Awards, 2002);

iv) Promoting leadership and community empowerment. Although the Lewa Conservancy influenced the development of the Il Ngwesi Group Ranch into a conservancy, community elders took it upon themselves to raise awareness among community members and secure their trust in project initiation; and

v) Gender equality and social inclusion- revenue from the eco-lodge venture is used to pay school fees for girls to attend schools and women are given opportunities in the management of the group ranch enterprises.

Conditions determining effectiveness:

1. Valuable environmental services with a ready market. The success at Il Ngwesi may not have been possible without the ready market for eco-tourism in the Laikipia Plain.
2. Relatively small and homogenous population of ecosystem stewards. The 500 households of Il Ngwesi are all Samburu pastoralists, whose pastoral way of life is itself an attraction for tourists.
3. Rights and negotiation context. The Il Ngwesi community was granted group land rights to the area in the 1960s as part of the Group Ranch movement. Kenya still does not have a formal policy on community-based ecotourism, and there is concern that many pastoral communities in Kenya have lost property rights in order to advance government-controlled ecotourism.

3.6 Case Study 6: Direct payments as a mechanism for conserving a wildlife corridor[10]

Context:

The Kitengela Group Ranch is located near by the City of Nairobi where it has traditionally served as a livestock grazing area for the Maasai pastoralists who live in the area, a dispersal area for wildlife from Nairobi National Park, and a wildlife corridor from Nairobi Park to the Kapiti plains. The Kitengela Group Ranch was maintained as group property until 1987, when it was subdivided and individual titles granted to the group members. This gave individual land users authority to decide what to do with their land. Due to the area's proximity to Nairobi City, land values were high and many Maasai further sub-divided and sold part or all of their land. Private entrepreneurs, including many non-Maasai, have purchased many of these individual holdings. Human population has more than doubled in the last 10 years and reduction of grazing areas have brought increasing poverty of the Maasai pastoralists, most of whom survive on an income of less than US$1 a day. Increased population, fencing of private lands, and urbanization have reduced connectivity between Nairobi National Park and the Kapiti plains. The Wildlife Conservation Lease programme implemented in the area now covers 85 km^2 and has 117 participating families. Plans are in place to expand the Wildlife Conservation Lease programme to a larger area.

[10] Sources: a) Makuli Ogeli. Mapping for change: Participatory GIS resource mapping for sustainable Development of the Maasai Community in Kitengela. A poster presented during the Africa CES regional workshop, 22-24 May 2006, ICRAF, Nairobi b) Projects' website; c) Katoomba Group Regional Workshop, and d). Gichohi H. W. 2003. Direct payments as a mechanism for conserving important wildlife corridor links between Nairobi National Park and its wider ecosystem: The Wildlife Conservation Lease Program. Africa Wildlife Foundation: Nairobi.

Scoping and negotiation:
The Wildlife Conservation Lease Programme evolved out of issues that were seen as negating important landscape connectivity between Nairobi National Park and dry-season grazing zones (which are also important for pasture for livestock). These issues included blockage and disruption of migratory routes, habitat fragmentation, increased poaching and human-wildlife conflicts. The programme was initiated in the year 2000 by Friends of Nairobi National Park and The Wildlife Foundation (TWF) based on research undertaken by the Africa Conservation Centre and the International Livestock Research Institute (ILRI). Research by ILRI showed that the average income from livestock grazing in the area was about US$ 8 / hectare / year. The payment of approximately US$4 / hectare / year is based on this calculation.

Implementation:
In return for agreeing not to fence, quarry, cultivate or subdivide the designated area of land, and to actively manage their land for wildlife and sustainable livestock grazing, TWF pays a fee of Kenya shillings 300/acre (approximately US$ 4 per acre) per year directly to the landowner. This arrangement is formalized through a written contract between each participating land owner and the Wildlife Conservation Lease (WCL) programme. The average participating household earns US$ 400-800/year in three payments, timed to match with the time that school fees are due to be paid. Payments have therefore been used mostly to support education of children in the participating families.

Conditions determining effectiveness:
1. Kenya has a global reputation for its wildlife resources, with Nairobi Park seen as an icon to the commitment to maintain those resources.
2. Rights and negotiation context. Individual land owners in the Kitengela area have freehold title to their land and are free to opt in or out of the WCL. Being involved in the programme means allowing wild animals free access to rangeland, a situation that the Maasai have long been familiar with.
3. Regulatory underpinnings. The WCL is consistent with Kenya's Wildlife legislation, although it is seen as a novel and pathbreaking application of the law.
4. Role of research. Research conducted by ILRI and the African Conservation Centre is seen as instrumental for laying the foundations for the WCL.
5. Transparency. A great deal of emphasis is put on transparency, with fees paid three times per year in open ceremonies. Field representatives of TWF are based in the area on a full-time basis to monitor conformance with the WCL programme. The WCL statistics and payments are recorded by computer, and also manually in a ledger book at TWF office.

3.7 Case Study 7: Agroforestry incentives through voluntary carbon payments [11], [12]

Context:
The Clean Development Mechanism (CDM) of the Kyoto Protocol makes some provision for afforestation and reforestation projects to generate tradeable carbon credits through carbon sequestration. To date, however, the stringent requirements of the CDM have meant that only one or two afforestation / reforestation projects have been registered by the CDM anywhere in the world. There is already, however, considerable experimentation with small-scale carbon

[11] Source: Byamukama Biryahwaho. Presentation to the African Regional Workshop on Compensation for Ecosystem Serivces, 24-25 May, 2006, ICRAF, Nairobi.
[12] Jindal, Swallow and Kerr (2006) documented about 20 carbon sequestration projects now active across Africa, now of which are registered with the Clean Development Mechanism.

sequestration projects, with the carbon sold on the voluntary carbon market. One such project has been implemented in Bushenyi District, Uganda.

Scoping / negotiation:
The project in Bushenyi has been led by the environmental foundation Ecotrust and implemented by over 100 local farmers. As of 2006, about 40 farmers had received payments for tree planting. The Edinburgh Centre for Carbon Management (ECCM) and the World Agroforestry Centre (ICRAF) have also been involved. Ecotrust has been coordinating the project, developing and maintaining a project-scale database, fund raising, issuing certificates and administering payments, contracting, documenting and conducting monitoring and evaluations. ICRAF was tasked to develop technical specifications and carbon monitoring protocols for the project. ECCM developed the modus operandi for the project, based on their experience with Mexico with a similar project, and helped to market the voluntary carbon credits.

Conditions determining effectiveness:

1. The experience in Bushenyi makes it clear that there is a market for voluntary carbon credits outside of the Clean Development Mechanism.
2. The upfront costs of establishing and institutionalizing the carbon scheme in Bushenyi have been very high relative to the payments made to date.
3. Insecure land and tree tenure can be insurmountable obstacles to individual-level carbon contracts.

3.8 Case Study 8: Compensation for the loss of ecosystem services due to water pollution in the Noyyal river basin, Tamil Nadu, India[13] [14]

Context:
Noyyal is a tributary of the River Cauvery, with 3510 km^2 of basin area, of which 50% is under cultivation. The major crops cultivated in the irrigated area are paddy rice and sugarcane, and cereals and cotton in the rainfed areas. The surface water of the basin is mainly used for irrigation, while groundwater is extracted for industrial use (85 million litres per day) and domestic use (150 million litres per day). Tanks, rivers, and reservoirs are sources of fish and fish catching was an important activity. The river has also been a place for release of waste.

The river basin has been facing growing problems of pollution from discharge of urban wastes and industrial effluents. Urban sewage and other wastes discharged by the two major urban areas, Coimbatore and Tiruppur; and the industrial effluents released by the textile bleaching and dyeing industries located around Tiruppur, where about 700 small and medium-scale bleaching and dyeing units are located. The pollution has impacted on several ecosystem services, particularly in the downstream, including: (i) loss of productivity of irrigated and rainfed agriculture; (ii) contaminating of drinking water sources, costing Tiruppur residents a total of US$ 2.7 million for alternative water supplies; (iii) contamination of industrial water, costing Tiruppur industries a total of US$ 20 million for alternative water supplies; (iv) loss of fish catch (total of US$ 33,000 loss); and (v) changes in biodiversity (changes in species composition and chronic insidious effects).

[13] Source: Based on a paper by Paul Appasamyand and Prakash Nelliyat, presented by Paul Appasamyand at the Asia Regional Workshop on Compensation for Ecosystem Services, ISEC, Bangalore, India, May 2006.
[14] There appear to be few examples of voluntary mechanisms of compensation for loss of ecosystems services, perhaps because of the generally weak enforcement of pollution standards. India may be one of the leading countries in the developing world in successful civil society action through public interest litigation. See, for example, Pargal and Mani, 2000.

Scoping and negotiation:
Farmers in the downstream area filed a case against the industrial polluters, bringing the situation to the attention of the judiciary. The court ordered for construction of effluent treatment plants; the Ecology Authority awarded a compensation of US$ 23 million. The court also set up an expert committee to advise on restoration of the Noyyal system. The expert panel noted that a limitation of the Ecology Authority is that it allows for compensation payments only for damage to property, damages which can only be claimed by registered land owners. The many landless people affected by the pollution have no legal recourse.

Conditions determining effectiveness:

1. The competitive and small-scale nature of the textile industry in the Noyyal river basin makes it unlikely that those firms would initiate any voluntary compensation schemes.
2. Recourse by citizen's groups to the Ecology Authority and the judiciary were important for getting public sector action and compensation payments on pollution control in the Noyyal River basin.
3. India's judicial system is known to be somewhat more independent and effective in enforcing environmental standards than the country's bureaucratic systems.
4. Details of the environmental law are important for the way that compensation payments are paid.

4. Summary and Conclusions

This paper brought together a unique combination of theory and case study evidence in an attempt to identify conditions for effective mechanisms of CRES in the tropics. Section 2 presented a review of five theories of institutional innovation, with their implications brought together into 11 hypotheses about conditions affecting the development and operation of mechanisms for CRES mechanisms.

The first three hypotheses emanate from the derived demand model for institutional change:

H1. Increased scarcities of environmental services, due to population growth, demographic shifts, and / or degradation of the ecosystem, will prompt increased demand for more secure property rights to environmental services and CRES mechanisms.

H2. The availability of profitable new technologies for using environmental services to generate economic outputs will translate into increased demand for more secure property rights for the services.

H3. New market opportunities for selling environmental services or outputs generated by those services will prompt increased demand for environmental services, new demand for compensation for resulting damage to ecosystems, and thus new demand for CRES institutions.

Hypotheses 4-6 emanate from the political economy models of institutional change:

H4. The development a CES or RES mechanism occurs in the context of a number of other rural institutions and interest groups, many of which directly affect the formation of interest groups, the transaction costs of institutional change, and the public choice process through which choices are made.

H5. Individual ecosystem stewards and environmental service beneficiaries in favour of RES or CES mechanisms will form coalitions that may exclude the poorest and most vulnerable members of society.

H6. Organizations that serve as intermediaries between ecosystem stewards and environmental service beneficiaries have their own objectives, which may align with one or another de facto interest group with the stewards and / or beneficiaries.

Hypotheses 7, 8 and 9 emanates from the 'ideas dominant,' 'settings dominant,' and 'chaos dominant' models of institutional change, respectively:

H7. CRES mechanisms are more likely to emerge and be effective where market and property rights institutions are most functional and engrained in people's beliefs about society.

H8. The development and operation of CRES mechanisms may be ineffective if the mechanisms are perceived to be inconsistent with social values related to the environment, markets, and / or property rights.

H9. CRES mechanisms may emerge at unexpected times and situations, and may be strongly associated with the activities of particular individuals or organizations who are able to spot suitable policy windows and advocate for them.

Hypothesis 10 is supported by international experience with the diffusion of environmental policy instruments.

H10. CRES mechanisms are more likely to be effective if they are consistent with national level and well supported by international organizations and networks.

Hypothesis 11 is supported by a model of the dynamics of soft and hard environmental policy instruments.

H11. CRES mechanisms are likely to be most effective where governments allow space for voluntary mechanisms, but less effective where governments expect CRES mechanisms to replace regulations.

Section 3 summarizes information from 8 case studies of CRES mechanisms, all of which were presented and discussed at regional workshops on compensation for environmental services convened in Latin America, Asia and Africa in 2006.[15] Results from the case studies provide support for most of the 11 hypotheses listed above, with different issues more or less obvious in the different cases.

Hypotheses 1, 2 and 3 discuss three demand-side characteristics – scarcity, technologies, new market opportunities – that might trigger new demand for CRES mechanisms. Of these three characteristics, new market opportunity seems to be most consistently supported by the case studies. Scarcity is less obvious as a motivating factor, considering that many of the Latin America CRES mechanisms are put in place to conserve the existing quality of ecosystems, while many of the African and Asian CRES mechanisms are put in place to restore highly degraded ecosystems. It appears that demand for environmental services is a more important condition for effective CRES mechanisms at the local than national level. For example, supply and demand conditions for watershed services vary greatly from watershed to watershed within a country, with relatively small catchment areas, occupied by small numbers of farmers, generally responsible for most of the problems of sedimentation of hydropower facilities and quality of

[15] More information on the regional dialogues is presented in the regional workshop reports (Poats, 2007 for Latin America; Raju et al., 2007 for Asia; Ochieng, Otiende and Rumley, 2007 for Africa).

drinking water supplies to urban areas. We found no evidence of new technology driving the formation of CRES mechanisms.

Hypotheses 4, 5 and 6 focus more on the institutional supply and political economy of CRES mechanisms. From the case studies, it appears that compensation and rewards for environmental services is still a relatively new area for policy making in most of the developing world, with relatively little formation of interest groups of proponents or opponents. Civil society dialogue and concern is perhaps most advanced in Latin America and India.[16] In general, local organizations are having relatively little influence on the development and diffusion of CRES mechanisms in the developing world. International networks, donor agencies and research organizations are still very important for the establishment, and continued functioning, of many of the CRES mechanisms in place. Given their very recent advent in many countries, however, there appears to be ample reason for continued funding. The only market opportunity where strong vested interests are emerging in many countries is the voluntary carbon market.

The settings dominant model of institutional change appears to be supported by some of the case study evidence. Countries that have most consistently embraced security of property rights (collective and private), market exchange, and environmental conservation are most likely to have effective CRES mechanisms. Countries with weak or failed systems of property and markets are unlikely to see the development of robust CRES mechanisms. Within countries or regions with favourable policy conditions, the ideas dominant model may explain the adoption and diffusion of CRES mechanisms.

Many of the case studies presented in this paper have been and continue to be supported by a number of multi-lateral agreements, international organizations and research – policy networks. Because they are signatories to a range of multi-lateral environmental agreements, most developing countries have established similar institutional foundations for CRES, despite very different circumstances of scarcity and threats to their ecosystems. Environmental laws in many developing countries might be best understood as framework laws that provide scope for CRES mechanisms. Successful case studies can provide the specific content and operational procedures for those framework laws. Research, monitoring and evaluation are important to justify the establishment, implementation and continued operation of public CRES mechanisms. This is particularly important for mechanisms involving larger areas and involving relatively complex cause-effect relationships.

Hypothesis 11 considers the link between CRES and regulatory policies. CRES mechanisms are more advanced in Latin America than any other region of the developing world, perhaps because they are seen as an alternative to weak public sector regulation. Both theory and evidence from the case studies indicate that there is a limit to the possibility for CRES mechanisms to replace regulation. Cap-and-trade systems, for example, require a level of regulation that may be missing in most of the developing world, with the possible exception of China. From other case studies, it appears that there is variation in the amount and type of regulation needed for different types of CRES mechanisms, with local mechanisms of payment for watershed services requiring relatively little regulation.

[16] The week following our Latin America workshop in Quito, Ecuador, there was another workshop in the Ecuador that raised concerns about the threat to indigenous people's rights.

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Our Vision is an 'Agroforestry Transformation' in the developing world resulting in a massive increase in the use of working trees on working landscapes by smallholder rural households that helps ensure security in food, nutrition, income, health, shelter and energy and a regenerated environment.

Our mission

Our mission is to advance the science and practice of agroforestry to help realize an 'Agroforestry Transformation' throughout the developing world.

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