HIGH-LEVEL POLITICAL FORUM
ON SUSTAINABLE DEVELOPMENT

The Role of Economic Policy Instruments in Integrated Land and Water Management

Roy Brouwer

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Biodiversity governance structures

- **Hierarchy** based arrangements

  ⇨ *Protected areas*

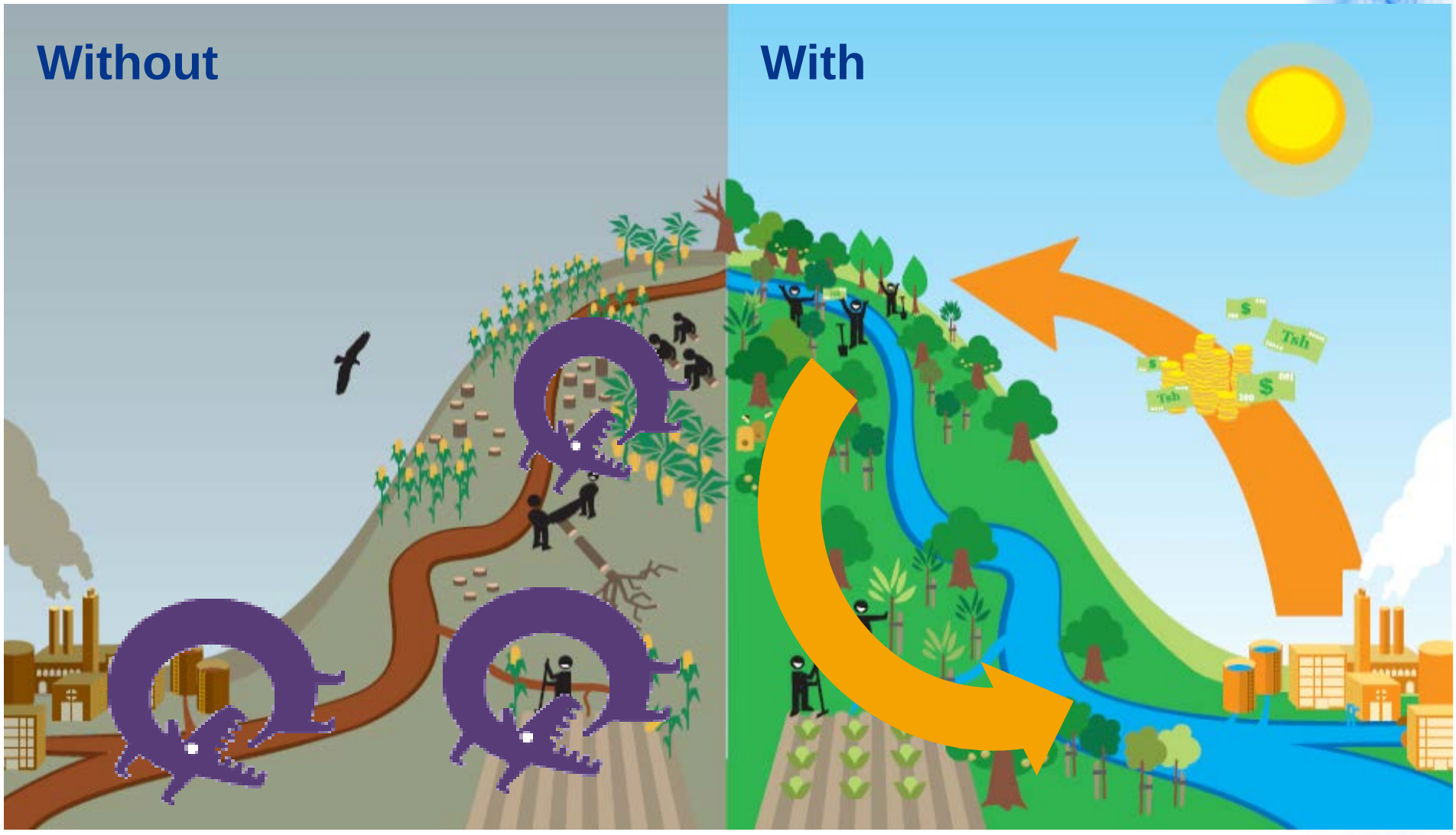
- **Market** based arrangements

  ⇨ *Payments for ecosystem services*

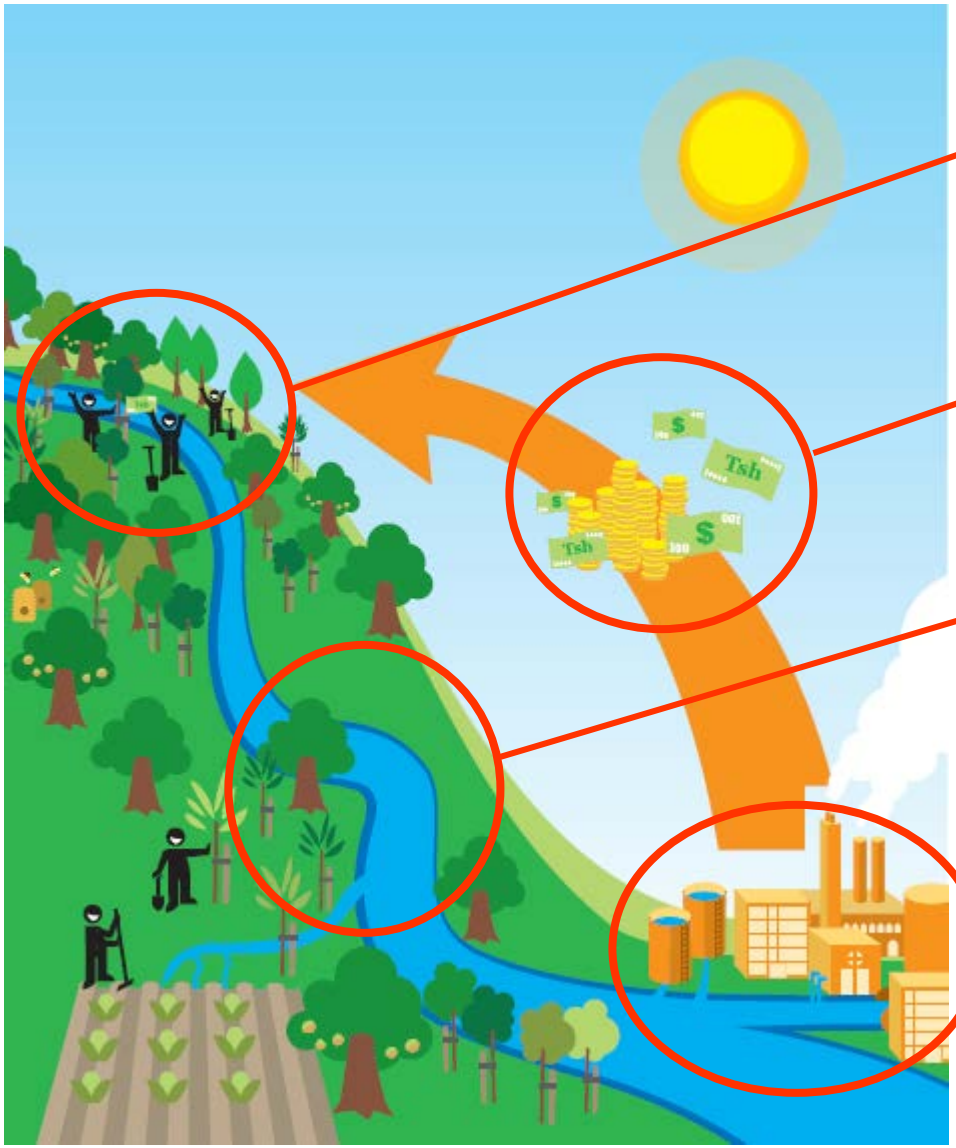
- **Community** based arrangements

  ⇨ *Co-management indigenous populations*

Payments for Watershed Services



What a decision maker needs to know



WTA upstream residents

Institutions & financial mechanisms

Hydrological & carbon assessment

WTP downstream beneficiaries

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ENVIRONMENT AND DEVELOPMENT

Get the science right when paying for nature's services

Few projects adequately address design and evaluation

By S. Naeem*, J. C. Ingram, A. Varga, T. Agardy, P. Barten, G. Bennett, E. Bloomgarden, L. L. Bremer, P. Burkill, M. Cattau, C. Ching, M. Colby,† D. C. Cook, R. Costanza, F. DeClerck, C. Freund, T. Gartner, R. Goldman-Benner, J. Gunderson, D. Jarrett, A. P. Kinzig, A. Kiss, A. Koontz, P. Kumar, J. R. Lasky, M. Masozera, D. Meyers, F. Milano, L. Naughton-Treves, E. Nichols, L. Olander, P. Olmsted, E. Perge, C. Perrings, S. Polasky, J. Potent, C. Prager, F. Quétier, K. Redford, K. Saterson†, G. Thoumi, M. T. Vargas, S. Vickerman, W. Weisser, D. Wilkie, S. Wunder

Payments for Ecosystem Services (PES) mechanisms leverage economic and social incentives to shape how people influence natural processes and achieve conservation and sustainability goals. Beneficiaries of nature's goods and services pay owners or stewards of ecosystems that produce those services, with payments contingent on service provision (*1*, *2*). Integrating scientific knowledge and methods into PES is critical (*3*, *4*). Yet many projects are based on weak scientific foundations, and effectiveness is rarely evaluated with the rigor necessary for scaling up and understanding the importance of these approaches as policy instruments and conservation tools (*2*, *5*, *6*). Part of the problem is the lack of simple, yet rigorous, scientific principles and guidelines to accommodate PES design and guide research and analyses that foster evaluations of effectiveness (*4*). As scientists and practitioners from government, nongovernment, academic, and finance institutions, we propose a set of such guidelines and principles.

POLICY

Because PES mechanisms directly link payments to environmental performance, they are often viewed as more efficient alternatives and complements to traditional regulatory or protection-based conservation approaches (*5*). Unlike the polluter-pays principle common to many environmental interventions, in PES, beneficiaries pay. PES beneficiaries can be governments, nongovernmental organizations, or private entities; owners or stewards can be governments, private, or communal land holders. PES interventions are increasingly used for securing nature's services while conserving species, curtailing deforestation, mitigating climate change, and pursuing social objectives such as sustainable livelihoods and poverty alleviation (*3*). Given the centrality of the ecosystem service framework to the Intergovernmental Platform for Biodiversity and Ecosystem Services (IPBES), the Convention on Biological Diversity, and the United Nations Sustainable Development Goals, and the expectation of innovative financing mechanisms to achieve the Aichi Targets (*6*), ensuring the scientific integrity of PES will be extraordinarily important.

SCIENCE, PRACTICE, AND THE GAP. Irrespective of scale or complexity, whether national [e.g., Costa Rica's PES program (*7*)], regional [e.g., New York City's and Munich's water supply (*8*)], or smaller-scale efforts [e.g., community-scale biodiversity conservation in Cambodia (*9*)], identifying whom to compensate, what to pay (i.e., money or other forms of incentives), how much to pay, the mechanisms for payment, and verification of service delivery are essential social and economic components to PES (*10*, *11*).

Although getting the social science right is critical for PES, we focus on the natural science because of growing concerns over scientific weaknesses (*2*, *5*, *6*, *12*). Success of PES initiatives is reliant upon scientific knowledge of the ecosystem services of interest, methods for verifying delivery of services, establishing a relationship between natural resource practices and the generation of a service, the spatial and temporal scale at which the service is produced, and factors that may threaten the service or trade-offs with other beneficial nontarget services (*13*). If any of these basic principles are not considered, the ability of PES mechanisms to generate ecological and social benefits may be undermined (*3*, *14*).

However, the scientific content of PES programs and projects varies enormously. Some of this is due to environmental urgency or social and political expediency that can promote implementation in advance of scientific analyses (*13*, *15*), the lack of sufficient scientific knowledge and data, or weak capacity and resources to monitor results and assess compliance (*4*, *9*). Practitioners are frequently better attuned than scientists to limited budgets, available technical capacity in environmental science, and knowledge gaps. Thus, disconnects often exist between science and practices developed by the research community and what is accessible and feasible in the field.

Reviews of designs, metrics, analytical methods, and perceptions of PES interventions reveal a need for greater coordination among scientific researchers, practitioners, ecosystem service providers, and beneficiaries (*5*). Collecting metrics for ecosystem services varies enormously in cost, utility, and complexity. Without tools for identifying the best and most affordable metrics, PES proponents may struggle to collect scientifically meaningful, cost-effective baseline data and implement effective monitoring programs.

We developed a framework for integrating natural science into PES based on six natural science principles encompassing 33 guidelines (see the table and the supplementary materials). Based on the work on these issues in Asia, Africa, Europe, North America, South America, and Australia, the principles are designed to be applicable across a range of ecological and social contexts. Although these principles were developed with a focus on PES, they may be useful for a range of market-based conservation instruments hampered by limited scientific evidence and empirical data on effectiveness (*6*). Many may apply to ecosystem service projects that do not include payment or incentives mechanisms.

We examined the degree to which active PES projects spanning several types of ecosystem services followed the principles and guidelines (see the supplementary materials). Of the 118 projects we examined, 60% lacked adherence to the four principles (see table) deemed essential to ensuring scientific integrity in environmental interventions: (i) baseline data, (ii) monitoring of key environmental factors and services, (iii) recognizing that ecosystems are dynamic, and (iv) inclusion of metrics, specifically on risks such as climate change or invasive species.

The context-specific nature and market uncertainties surrounding PES (*16*) may make accommodating even these basic principles difficult. Consideration of the principles is recommended even if resources or capacity do not permit extensive scientific measurement or analyses. The principles are designed so that they are not onerous to

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†The views and opinions expressed in this paper are those of the authors and not necessarily the views and opinions of USAID or U.S. EPA. See full list of affiliations online.

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Meta-analysis of institutional-economic factors explaining the environmental performance of payments for watershed services

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THEMATIC SECTION
Payments for Ecosystem Services in Conservation: Performance and Prospects

SUMMARY

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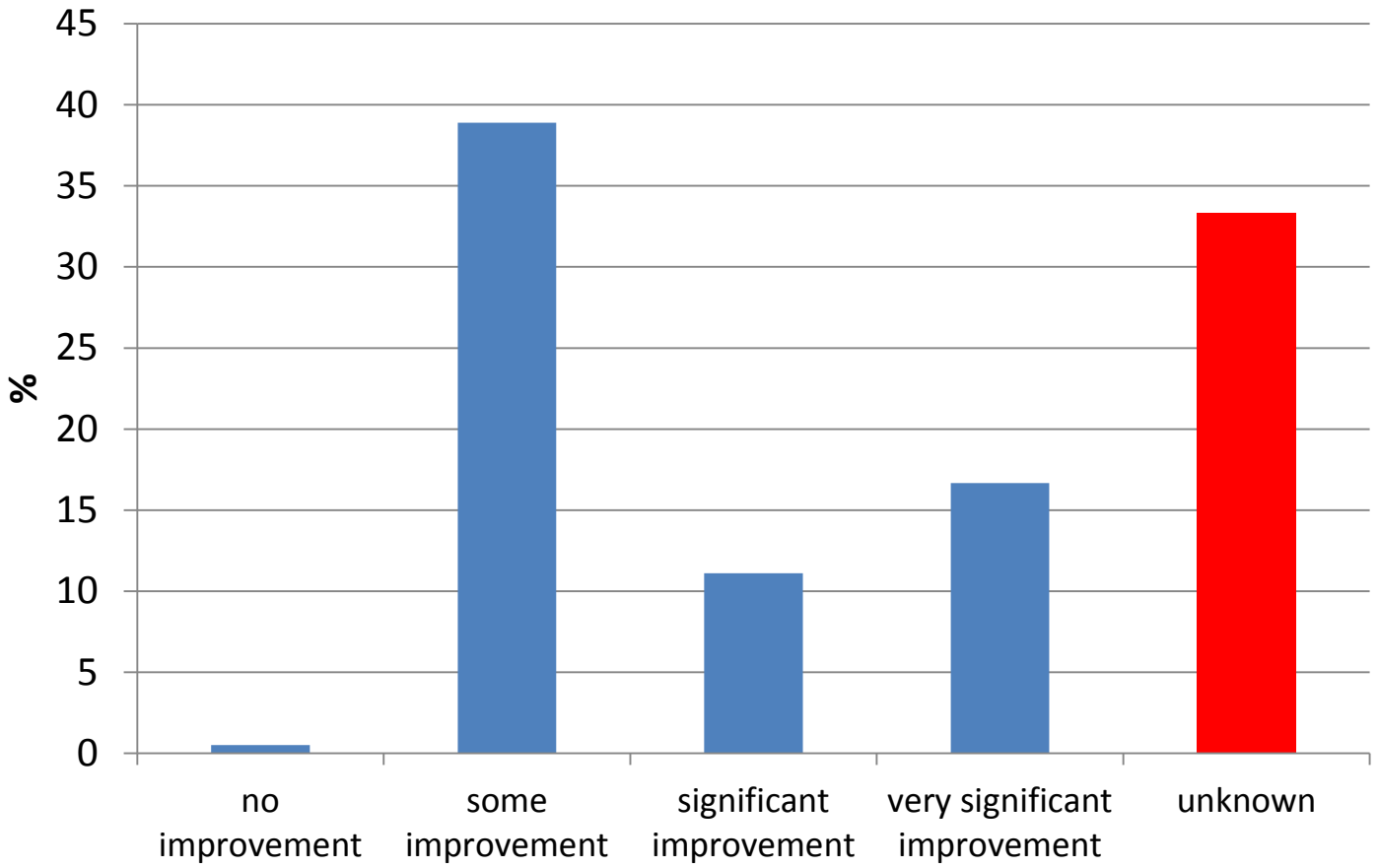

INTRODUCTION

Payments for ecosystem services (PES) are a relatively new economic policy instrument, which aim to translate the often

showed that tying PES and poverty reduction may result in lower efficiency in meeting either objective, thus it may be better to focus programmes that concentrate on one or the other objective separately. Wunder *et al.* (2008) conducted a comparative analysis of PES in developed and developing countries between user financed and government financed schemes using different criteria, including design, costs, environmental effectiveness and livelihood outcomes.

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nature sustainability

ANALYSIS

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From principles to practice in paying for nature's services

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Payments for Environmental Services (PES) constitute an innovative economic intervention to counteract the global loss of biodiversity and ecosystem functions. In theory, some appealing features should enable PES to perform well in achieving conservation and welfare goals. In practice, outcomes depend on the interplay between context, design and implementation. Inspecting a new global dataset, we find that some PES design principles pre-identified in the social-science literature as desirable, such as spatial targeting and payment differentiation, are only partially being applied in practice. More importantly, the PES-defining principle of conditionality—monitoring compliance and sanctioning detected non-compliance—is seldom being implemented. Administrative ease, multiple non-environmental side objectives and social equity concerns may jointly help explain the reluctance to adopt more sophisticated, theoretically informed practices. However, by taking simplifying shortcuts in design and implementation, PES programmes may become less environmentally effective and efficient as economic incentives, thus underperforming their conservation potential.

Continued environmental degradation calls globally for innovative policies to bridge real trade-offs between environmental and development goals[1]. Payments for Environmental Services (PES) arose from the hope to deal more consciously with such trade-offs in nature conservation and environmental governance, directly incentivizing landowners and other resource stewards to adopt environmentally friendly practices. Theoretically, PES feature a quid pro quo paradigm of conditionality: you only pay for what you get[2,3]. They aim to enhance the additionality of environmental services (ES) provided, that is, better environmental outcomes compared with a business-as-usual baseline. In practice, additionality will depend on the interplay between context, design and implementation. However, often environmental effectiveness is not the only policy objective of PES; frequently (implicit or explicit) other goals, especially related to human welfare and social equity, are at play[4–6].

PES implementation has expanded quickly in the past two decades, and impact evaluation studies are emerging with first lessons[7–9]. The potential for PES to be direct and performance based, yet flexible, negotiated and fair is promising[2,4,10], although trade-offs with poverty and equity goals[11,12], and among different environmental goals[13], have raised concerns. A poor biophysical science base might also render PES ineffective[14]. Sometimes, short-run payments can effectively induce change, for example, subsidizing the adoption of sustainable technologies[15], yet often payments and financing structures have to be of a lasting nature to ensure that environmentally desirable practices continue over the long term[16].

A salient question pertains to the role of the social-science foundations of PES. In particular, to what extent do practitioners incorporate state-of-the-art thinking into PES design and implementation for effective and efficient, yet equitable outcomes? Without denying biophysical preconditions for PES[14], we argue that the social sciences play a vital role in this pre-assessment. As economists debating PES functionality, here we discuss the preconditions for PES implementation and informed economic principles of PES design, followed by an empirical stocktaking of the degree to which these principles are de facto being implemented, including when looking at different targeted ES. In explaining our findings, we analyse the role of transaction costs and equity considerations related to different design and implementation practices. We conclude by discussing the implications for environmental policies and strategies.

Preconditions for PES

While PES programmes are conceived to bridge conflicts between ES users and providers over management of natural resources, perceiving PES as a silver bullet could easily misguide conservation investments[10–12]. Decision-makers should always evaluate the pertinence of PES vis-à-vis other available policy instruments. In our view, four preconditions should be checked[10,17,18]:

(1) ES users' willingness to pay likely exceeds ES providers' willingness to accept compensations. This is a fundamental economic reality check for PES: does the user-perceived value of the ES exceed the value of landholders' expected costs of ES delivery? Usually we know neither the precise value of the ES nor the precise cost of participation, but we can make informed guesses.

(2) ES users are capable of internally organizing payments. In other words, the ES user (or public) institutions are in place to champion the introduction and administration of PES.

(3) ES providers have sufficiently secure user rights over environmentally important resources to effectively exclude third-party intrusions. More specifically, landowners and resource stewards need to actually be in charge of the decision-making processes that will come to determine ES provision.

(4) Any pre-existing intrinsic motivations for good stewardship are not crowded out by extrinsic PES incentives. In other words, payment on balance needs to motivate ES providers to sustainably deliver more ES.

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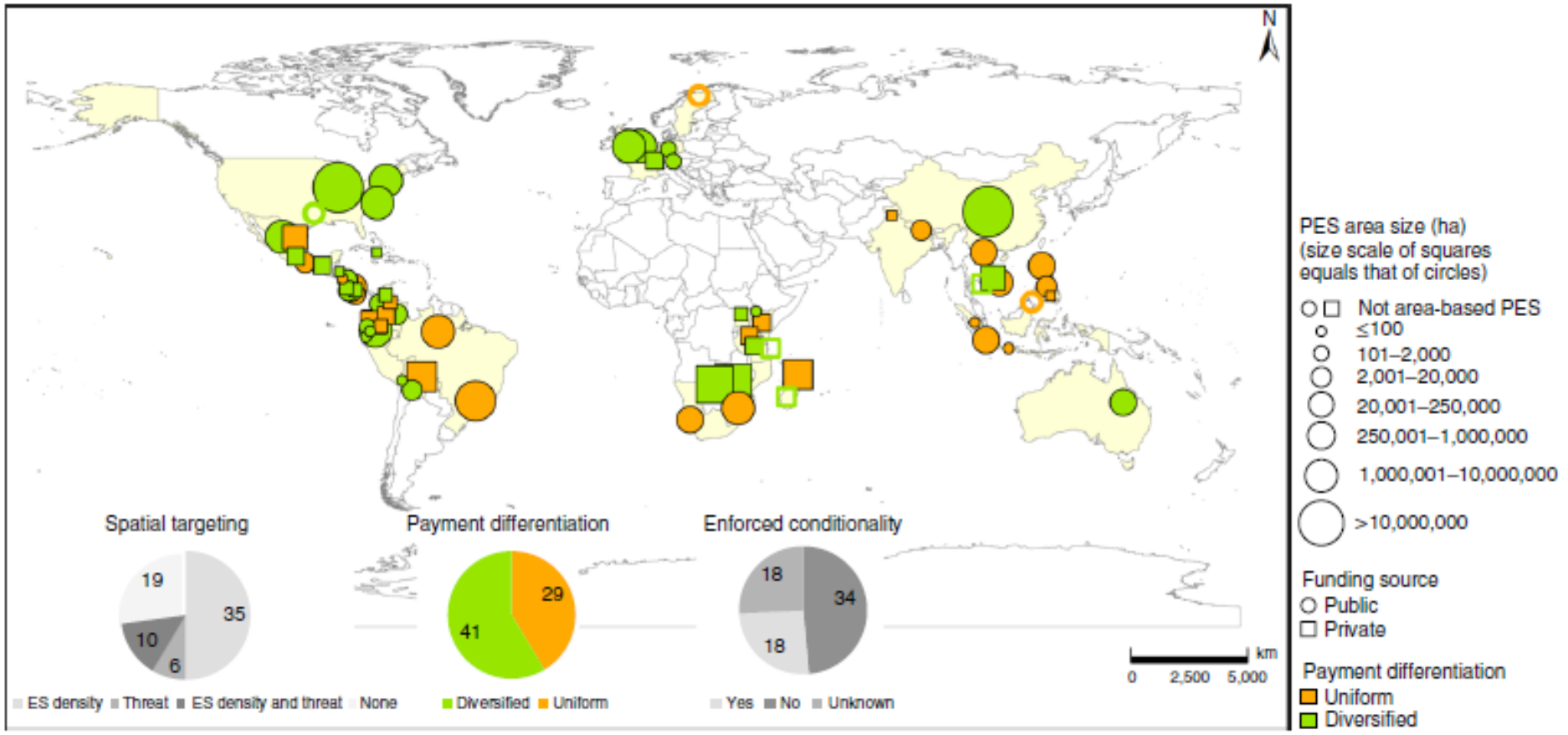
Key PES principles



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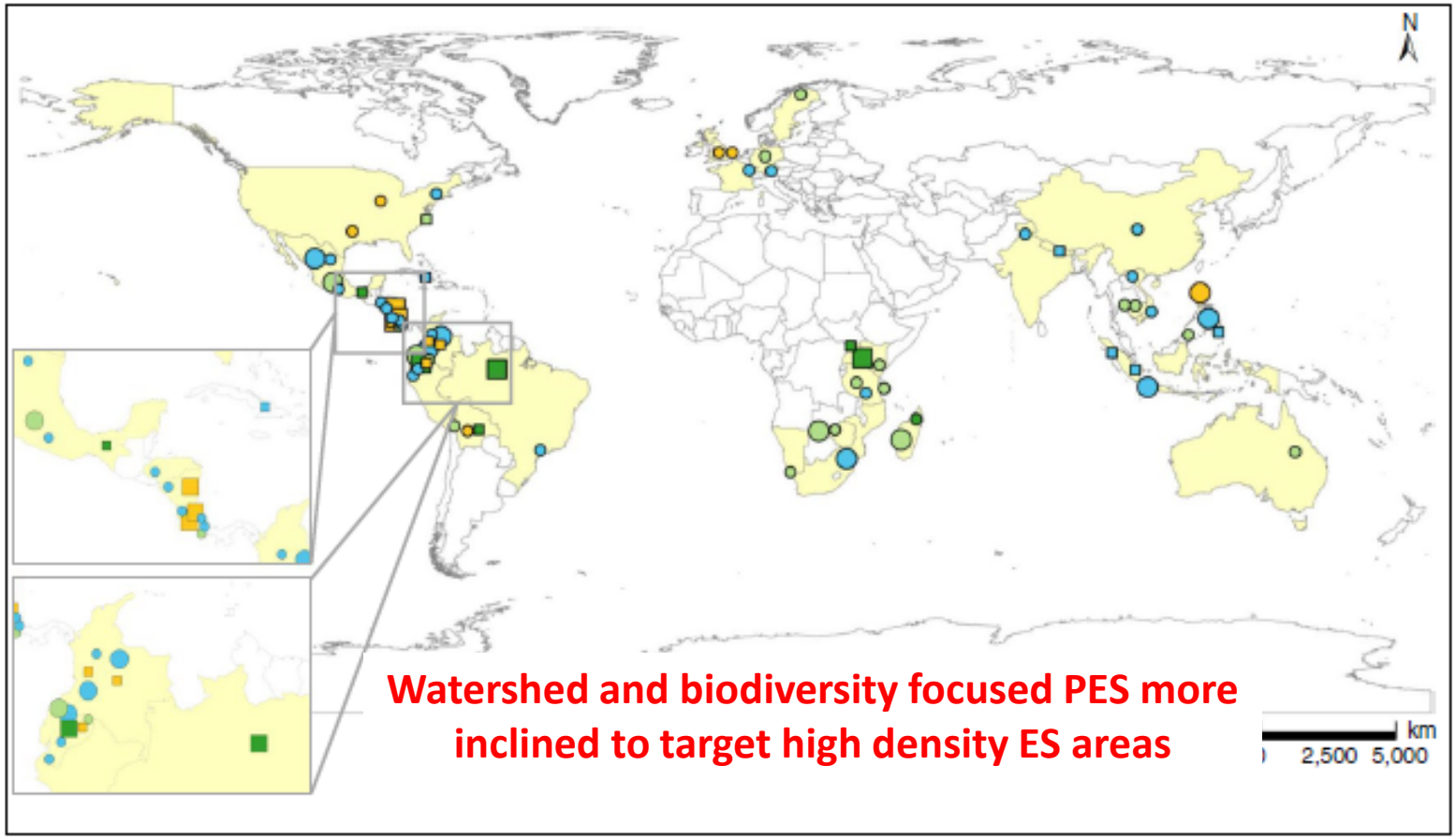
Key findings

- Half target terrestrial ecosystems (51%)
- Followed by land-water interactions (46%)
- 27% target biodiversity directly



Conclusions

- Forests in watersheds a nature based solution to water security
- Understanding and steering land use changes for biodiversity conservation in watersheds crucial
- Need for behavioral change & cost-effective instruments
- PES promising but need for better targeting
- International monitoring guidelines needed

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Thank you for your attention!

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