



# Contextualizing context in the analysis of payment for ecosystem services



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## ABSTRACT

For over a decade, payment for ecosystem services (PES) programs has been designed in several countries, the analysis of these programs in recent years highlights the importance and timeliness of the tool. Taking local context into account stands out among the most significant recommendations for the design and implementation of PES programs. However, no clarity or consensus has emerged about how to define and approach “context”. This article proposes to address this issue using the socio-ecological systems (SES) framework. We present conceptual interpretations of context and define and validate the primary set of variables for its characterization. Our analysis is based on a literature review and surveys of people who have implemented these programs in Mexico. We propose “focal”, “very significant”, and “significant” variables, which allow us to define local context within the framework of PES programs. The proposed focal variables are a) forest cover, b) opportunity cost, c) livelihood and productive diversification, d) pro-social and pro-environmental motivations and attitudes, e) confidence and cooperation, f) traditional management practices, g) internal organization on the local level, h) land tenure, and i) rules for the management and use of natural resources.

## 1. Introduction

A variety of tools have been developed to halt the loss and erosion of ecosystems. Of these, economic tools (Moreno-Sanchez, 2012) are recognized as an efficient solution, they involve lower costs than other tools, provide incentives for innovation, and simultaneously produce social and cultural benefits (Lockie, 2013).

Although the use of economic tools for conservation has increased in recent decades, the need remains to analyze various elements with greater care (Gómez-Baggethun and Muradian, 2015). These elements include traditions, and relationships between households and forests, which determine patterns of resource use and consequently affect the outcomes of tool implementation (Lapeyre et al., 2015). Other relevant factors include culture, social diversity, and power dynamics (Van Hecken et al., 2015).

Similarly, several authors agree that economic tools for conservation should account for history, and the environmental, cultural, institutional, and social characteristics of the territory and the communities where the tools will be implemented (Frost and Bond, 2008; Cranford and Mourato, 2011; Rodríguez et al., 2016).

Following the goal to contribute to the clarification of “context” within the economic tools for conservation, we suggest that the analysis of the conceptual interpretations of “context” and the definition and validation of a primary set of variables for its characterization could

help to the successful development of PES programs.

Although the analysis of context in PES schemes has been mentioned as a relevant issue, it has not been widely analyzed before. In addition, a proposal of PES context variables, following SES framework, has not been deeply documented.

In the following section, economic tools for conservation are defined, the development of Payment for Ecosystem Services (PES<sup>1</sup>) programs is highlighted as a key example of such a tool, and the context and analysis of socio-ecological systems is addressed. Our methodology, results, discussion, and conclusions are then presented.

### 1.1. Economic tools for conservation and payment for ecosystem services

Economic tools for conservation are defined as incentives in economic decision-making (costs and benefits) that economic agents encounter (CEPAL, SEMARNAP, 1998) and that allow them to reduce (or eliminate) market failures in providing ecosystem services. Failures lead to allocations or uses that are not socially desirable and are associated with externalities, property rights (such as common or public resources), and asymmetrical information (Rodríguez, 2014).

These instruments make it possible to modify the behavior of ecosystem users and administrators, and the most relevant example is payment for ecosystem services (Pirard, 2012).

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<sup>1</sup> The PES scheme refers to all programs. PES does not refer to a unique program or group of ecosystem services, or a group of sellers or buyers.

Payments for environmental services are defined as voluntary transactions between users and service providers, shaped by defined rules regarding natural resource management, to generate ecosystem services (Wunder, 2015).

Various PES programs exist. There are programs in which the buyer of ecosystem services is the state (Zander et al., 2013; Bremer et al., 2014; Perevchtchikova and Rojo, 2015; Rodríguez et al., 2016) or local schemes in which direct resource users participate (Moreno-Sánchez et al., 2012; Muñoz-Escobar et al., 2013).

The services exchanged primarily include hydrological resources, conservation of biodiversity, and, more recently, carbon dioxide capture via mechanisms such as Reducing Emissions from Deforestation and Forest Degradation (REDD).

In terms of PES outcomes, significant potential gains have been noted in cost efficiency compared with other indirect payments and other regulations such as command and control mechanisms and environmental taxes (Alix-García et al., 2004; Sierra and Russman, 2006; Engel et al., 2008). It is also noteworthy that PES has promoted pro-conservation attitudes, greater environmental awareness, and reduced pressure on ecosystems (Kosoy et al., 2008; Muñoz-Piña et al., 2008; Rico et al., 2011; Rodríguez and Ávila, 2013; Rodríguez et al., 2016).

Conversely, some observers have noted that the tool's design does not take into account the worldview of the primarily rural communities where it is implemented (Gómez-Baggethun et al., 2010; Pascual and Corbera, 2011). Thus, the instrument can lead to a split between ecosystem conservation and the production and conservation strategies of those who own the land (Madrid, 2011). Also, passive attitudes, and the loss of decision-making power related to community assets (Merino, 2004).

Multiple authors (Muller, 2008; Petheram and Campbell, 2010; Mañez, 2011; Juanwen et al., 2012; Zander et al., 2013) highlight the importance of taking into account social, cultural, institutional, and historical factors that influence local actors' decisions when designing and implementing tools.

### 1.2. Socio-Ecological Systems (SES) as a framework to analyze context

Context analysis is considered a significant element for the design, implementation, and evaluation of public policies related to sustainable development and conservation of ecosystem services (Merino and Martínez, 2014).

However, the definition of context tends to be very broad and general. According to Panelli (2002), context includes the processes that shape people's surroundings, which constrain and/or enable life, including circumstances, structures, and processes that create a dynamic, it also includes cultural, social, economic, political, and spatial elements.

Licha (2000) notes that context may be immediate or distant and highlights that its analysis enables the identification of opportunities, challenges, and risks in policy implementation.

López et al. (2014) underline that the study of context offers clues to understanding the problems that actors face and provides a foundation for the proposal of alternatives. Context includes forces, actors, deeds, and events that come about as a result of political, social, technological, cultural, and national and international economic dynamics.

Echoing McGinnis and Ostrom (2014), Socio-Ecological System (SES) framework provides a basic vocabulary of terms and concepts used to build explanations. The SES framework, understood as ecological systems that are closely tied to, and affected by, one or more social systems (Anderies et al., 2004), is an interpretive framework (Merino, 2014) that uses definition of variables to describe the context within which an action situation occurs.

SES are defined as complex adaptive systems in which social and

biophysical agents interact on multiple temporal and spatial scales (Janssen, Ostrom, 2006). This framework enables the analysis of the factors that determine social responses to specific disturbances (Forrest et al., 2009), highlighting the more relevant environmental, social, economic, and political factors taking place in these processes (McGinnis and Ostrom, 2014). These elements are: systems of resources, resource units, systems of governance, actors and surrounding elements or exogenous influences. These elements constitute the first level of variables of the SES scheme, which can be unfolded in second and third level variables. In addition, all actions are treated as inputs and are transformed by actors' actions into outcomes.

Within this framework, an economic tool, such as PES, can be considered as an action situation, which triggers a series of interactions and outcomes in each of the first level variables of the SES scheme.

For example, the system and the resource units of a certain resource present in a community determine the initial eligibility of the region to be considered in the PES program. The governance system and the performance of those actors involve are critical for the implementation and results of the PES. The way in which PES scheme is implemented affects the systems of resources and resource units (i.e., increases of the forest mass or improvement of water quantity and quality). Ways of PES implementation influence governance systems (i.e., strengthening local organizations, levels of confidence between actors). As well as actors' attributes (i.e., changes in socioeconomic conditions).

We understand "context" as the whole Socio Ecological System (Ostrom sensu) without including the "action situation" and the relations developed within the system. In other words, "context" can be defined in terms of the general conditions (environment, economic, social, cultural, political, etc.) present at any given time.

## 2. Methods

We took as reference the work of Bennett and Gosnell (2015) in which they propose a preliminary integration of PES and SES framework; as well as the work of Hejnowicz et al. (2014) who analyze the outcomes of PES through a systematic review, using a capital asset framework. We used a three-phase methodology to propose a group of key variables for defining context in PES programs (Fig. 1). Context variables were first defined via a literature review. Additionally, these were validated and new variables were identified through the design and application of a survey given to PES program implementers in Mexico, a country with a widely development of PES.

The validation of these variables represents an innovation, because it combines the literature review and the experience of PES implementers.

In 2003, the Mexican government designed and applied Payments for Hydrological Ecosystem Services (PHES) and then ecosystem services such as biodiversity conservation, carbon fixing, and services generated by agroforestry (CABSA) were included in the policy's scope (Perevchtchikova and Oggioni, 2014).

Over the last decade, PES programs in Mexico have evolved (Rodríguez and Ávila, 2013) and new programs have been designed. These include the Patrimonial Fund for Biodiversity, concurrent Funds via local payment mechanisms, and early REDD alerts, which seek to bring together users and providers of ecosystem services and broaden the participation of new actors in these programs.

The National Forestry Commission (CONAFOR) acts as an executor of the programs. Outreach workers for ecosystem services, technicians, professionals or organizations, and non-governmental groups also advise and train communities, help them access to the tool, facilitate the transfer of knowledge between CONAFOR and ecosystem service providers, build local capacities, and prepare a progress report about the projects for CONAFOR (Kosoy et al., 2008).

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