



## Research article

# Value orientation and payment for ecosystem services: Perceived detrimental consequences lead to willingness-to-pay for ecosystem services



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## ABSTRACT

This research analyzed whether the three distinct value orientations posited under the Value-Belief-Norm (VBN) model determine willingness-to-pay (WTP) for a payment for ecosystem services (PES) program. A survey instrument gathered U.S. residents' knowledge and attitudes toward ecosystem services and PES, and elicited WTP for the restoration of a hypothetical degraded forest watershed for improved ecosystem services. Data from over 1000 respondents nationwide were analyzed using exploratory factor analysis (EFA) and ordered logistic regression. Urban respondents were more familiar with the concepts of ecosystem service and PES than rural respondents but familiarity did not yield statistically different WTP estimates. Based on results from the EFA, we posit that latent value orientations might be distinguished as 'detrimental', 'biospheric' and 'beneficial (egoistic)' – as compared to 'altruistic', 'biospheric' and 'egoistic' as suggested in the VBN's general awareness of consequences scale. Awareness of biospheric and detrimental consequences along with ascriptions to personal norms had positive and significant effects on stated WTP. Beneficial (egoistic) value orientation was negatively associated with WTP and carried a negative average WTP per household per year (US\$ -30.48) for the proposed PES restoration program as compared with biospheric (US\$ 15.53) and detrimental (US\$ 3.96) orientations. Besides personal norms, awareness of detrimental consequences to human wellbeing from environmental degradation seems the stronger driver of WTP for the restoration and protection of forest watershed ecosystem services under a PES program.

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## 1. Introduction

Forest ecosystems provide tangible and intangible benefits that sustain human well-being (Millennium Ecosystem Assessment, 2005). While tangible benefits (e.g. timber, game and fruits) are traded with observable price and value signals, intangible benefits (e.g. wildlife habitat, water filtration, and carbon sequestration) typically lack pricing from traditional market transactions (Baranzini et al., 2010; Chiabai et al., 2011; Duncker et al., 2012; Kosoy and Corbera, 2010). As a consequence of their non-excludable and non-rival (quasi) public good characteristics, intangible non-market forest ecosystem services are often

underprovided as forests are managed to maximize profits from marketable products (Muradian et al., 2010; Roesch-McNally and Rabotyagov, 2016). A lack of financial incentives to land owners to internalize benefits associated with non-market benefits, along with explicit and implicit policy programs that favor the supply of market goods, have contributed to the detrition in the flow and quality of forest ecosystem services (Arriagada and Perrings, 2009; Bond et al., 2009; Obeng and Aguilar, 2015; Pearce, 2001).

Public policy strategies have been devised to focus on healthy forest ecosystems capable of providing both market and non-market benefits to society. Specifically, payments for ecosystem service (PES) programs have emerged to offer financial incentives to land managers in exchange for specific practices poised to maintain or enhance a range of non-market forest ecosystem services (Pagiola, 2008). PES is defined as a market-based approach where providers of ecosystem services are compensated by those who benefit from the services they manage, hence, increasing their

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incentive to conserve them (Daily and Matson, 2008; Engel et al., 2008; Pagiola, 2008; Robertson and Wunder, 2005; Wunder and Alban, 2008). Effective PES-based incentives should offset the opportunity cost of maintaining management practices capable of supporting positive environmental externalities. As PES programs continue to expand, there is a need to understand the public's awareness, attitudes toward, and willingness to engage in such programs (López-Mosquera and Sánchez, 2012). More specifically, there is the need to better understand factors behind willingness-to-pay (WTP) for forest ecosystem services to assure the financial feasibility of PES programs.

A multi-disciplinary approach that encompasses cultural, socio-economic and psycho-social dimensions is needed to understand underlying factors behind WTP for a PES program (Muradian et al., 2010; Smith et al., 2013). As a type of pro-environmental behavior, willingness to participate and pay for a PES program has been examined as a function of socio-demographic characteristics (e.g. age, gender, income, education) and psycho-social variables (values, beliefs, moral norms and attitudes) (Clark et al., 2003; De Groot and Steg, 2008; Kang et al., 2012; Kotchen and Reiling, 2000; López-Mosquera and Sánchez, 2012; Spash and Hanley, 1995; Spash et al., 2009). Socio-demographic variables including age, income, education, and marital status have been noted to explain only modest levels of variance in individual's environmental behavioral decisions (Sauer and Fischer, 2010). Conversely, attitudinal and ethical variables have not been frequently employed to explain heterogeneity in WTP estimates compared to socio-economic variables (Ojea and Loureiro, 2007). There is limited empirical research offering an integrated perspective to better understand and predict WTP for non-market forest ecosystem services in the context of PES programs.

One of the most popular approaches to understanding behavioral constructs is the value-belief-norm (VBN) model proposed by Stern et al. (1999). The VBN model is based on the premise that an individual's behavior towards the environment is influenced by values, beliefs and moral norms. Under the VBN model three distinct value orientations (biospheric, egoistic and altruistic) define an individual's general awareness of consequences (GAC) to nature, self and other people. These value orientations together with ascriptions to personal norms and perceived ability to reduce environmental threats offer a framework to examine environment-related behavioral intentions reflecting individuals' WTP decisions (Fielding et al., 2008; Hansla et al., 2008; López-Mosquera and Sánchez, 2012; Menzel and Bögeholz, 2010; Oreg and Katz-Gerro, 2006; Spash, 1997, 2006; Stern et al., 1995). To date, the PES literature has largely omitted discussions on whether individuals would be willing to pay to support a PES program for forest ecosystem conservation to ensure continuous provision of services for themselves or others. Moreover, the literature seems devoid of assessments linking attitudes and value orientations along socio-demographic characteristics in a single model explaining WTP for PES initiatives.

This study applied the VBN model to examine WTP for a hypothetical PES program designed to restore a degraded forest watershed ecosystem. A stated preference survey was implemented to examine how attitudes, values and norms influenced WTP for PES restoration programs in the U.S. Furthermore, we compared levels of familiarity and attitudes toward non-market forest ecosystem services, PES program participation and WTP levels between urban and rural residents to examine differences related to knowledge, socio-cultural and ecosystem proximity effects (Garber-Yonts et al., 2004). WTP values were elicited for a geographically-distant ecosystem to prevent direct use of the resource but from which corresponding ecosystem services could still contribute to respondents' wellbeing (Newton et al., 2016).

Empirically, a PES program to restore an out-of-state forest watershed in the U.S. was selected as households might be dependent on ecosystems services irrespective of geographic proximity. Moreover, the WTP choice was instrumentalized to examine whether egoistic motivations would still be major drivers behind stated pro-environmental behavior even though the degraded ecosystem may not pose a direct threat to their wellbeing (Schwartz, 1992; Hansla et al., 2008). Individuals may be willing to pay based on self-centered grounds and expect others to derive direct benefits regardless of whether they pay or not in order to conserve an ecosystem driven by egoistic and altruistic values. Others may also be willing to pay to support a program restoring distantly-occurring ecosystem services motivated by biospheric existence<sup>1</sup> or future option values.

## 2. Aim and objectives

This study aimed to better understand how values, beliefs and norms, in addition to selected knowledge and socio-demographic variables, influence WTP for a PES program in the U.S. Three specific objectives guided this research. The first objective was to identify the level of knowledge and attitudes toward the concepts "ecosystem services" and "PES" among U.S. residents and determine differences between urban and rural populations. The second objective was to validate whether the GAC scale would discern three value orientations (biospheric, egoistic and altruistic) based on the analysis of respondents' environmental attitudes. The third objective was to quantify the effects of VBN variables and socio-demographic descriptors on WTP for a hypothetical PES program to restore a forest watershed.

## 3. Theoretical framework

The VBN proposes that biospheric, egoistic and altruistic orientations influence environmental perceptions, behavior and how individuals formulate and structure environmental attitudes and beliefs. Environmental attitudes that emerge out of actions taken to avoid consequences over nature are classified as a biospheric orientation; actions taken because of beliefs of consequences incurred on oneself encompass an egoistic orientation; an altruistic orientation emerges if actions are motivated by concern of consequences on others (Stern et al., 1993, 1995; Stern, 2000; Spash, 2006; Ojea and Loureiro, 2007; De Groot and Steg, 2008; Ryan and Spash, 2012). In the VBN model, each value orientation predisposes individuals to be concerned about consequences of their behavior on things they value. An individual is thus assumed to be more receptive to certain information depending upon her particular value orientation that in turn, influences beliefs and ultimately behavior (Ryan and Spash, 2010).

People who believe that an environmental condition has adverse consequences for the things they value will be predisposed to take action to improve or remove the existing threat (Stern et al., 1993). Environmental consequences have been articulated in two attitudinal scales namely, "Awareness of Consequences (AC)" and "Environmental Concerns (EC)". Both scales focus on the underlying factors of concern for the environment and the influence of environmental consequences on one's self, other people, and nature (Stern et al., 1993; Weigel and Weigel, 1978). In the VBN model, the AC scale has been integrated and generalized around the EC scale to form the GAC scale (Stern et al., 1993). In this study we applied the

<sup>1</sup> Existence value may be defined as an individual's economic value from simply knowing that a particular ecosystem or natural environment exists, independently of her use (Krutilla, 1967).

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