Water International

ISSN: 0250-8060 (Print) 1941-1707 (Online) Journal homepage: https://www.tandfonline.com/loi/rwin20

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To cite this article: Dawit W. Mulatu, Pieter R. van Oel & Anne van der Veen (2015) Firms' willingness to invest in a water fund to improve water-related ecosystem services in the Lake Naivasha basin, Kenya, Water International, 40:3, 463-482, DOI: 10.1080/02508060.2015.1050580

To link to this article: https://doi.org/10.1080/02508060.2015.1050580

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Water International, 2015
Vol. 40, No. 3, 463–482, http://dx.doi.org/10.1080/02508060.2015.1050580

Routledge
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Firms' willingness to invest in a water fund to improve water-related ecosystem services in the Lake Naivasha basin, Kenya

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(*Received 9 June 2014; accepted 9 May 2015*)

A valuation scenario was designed using a contingent-valuation approach and presented to decision makers in business firms in Kenya's Lake Naivasha basin to test how applicable a water fund might be as a potential financing mechanism for a payment for water-related ecosystem services scheme. The findings indicate that measuring a firm's willingness to invest in ecosystem services could help determine whether a firm would invest and engage with other stakeholders to pool their investments in ecosystem services. Linking the institutional decision-making behaviour of a firm and its willingness to invest in a water fund is the novelty of this article.

Keywords: water fund; payment for ecosystem services; firms; willingness to invest; Lake Naivasha

Introduction

Payment for ecosystem services (PES) approaches have become increasingly popular world-wide as a way to use economic incentives to manage ecosystem services (Schomers & Matzdorf, 2013). PES has attracted increasing interest as a mechanism to translate external, non-market values of the environment into real financial incentives for local actors to provide such services (Engel, Pagiola, & Wunder, 2008). PES ensures a payment or preference for compensation/rewards for those willing to provide or to improve ecosystem services. PES is a voluntary transaction where a well-defined ecosystem service is bought from the ecosystem services provider by a buyer and assures service provision for those who are willing to pay for the service (Wunder, 2005). However, each alternative PES scheme has its own unique characteristics in terms of the forms of payment, the stakeholders involved, the financing mechanisms and the institutional arrangements (Goldman-Benner et al., 2012). PES programmes also differ in the type and scale of ecosystem services, the payment source, the type of activity paid for, the performance measure used, and the payment mode and amount (Engel et al., 2008).

Recently studies have been carried out to support the alternative financing mechanisms and institutional arrangements of PES schemes (Engel et al., 2008; Muñoz Escobar,

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Hollaender, & Pineda Weffer, 2013; Pagiola, 2008; Wunder, 2005). Integrating PES into conservation approaches can diversify the sources of funding for conservation practices (Goldman-Benner et al., 2012). A common conceptual approach underlying PES schemes employs a Coasian concept of PES programmes (Schomers & Matzdorf, 2013) derived from a Coasian market economics approach (Coase, 1960). Government PES programmes are called either 'government-financed PES schemes' or the 'Pigouvian concept of PES programmes' (see e.g. Pattanayak, Wunder, & Ferraro, 2010; Wunder & Alban, 2008). A 'user-financed' PES programme is when buyers are the actual beneficiaries of ecosystem services (Engel et al., 2008), whilst other approaches employ 'self-organized private deals' and 'public payment schemes' through negotiation between concerned stakeholders (Perrot-Maitre & Davis, 2001; Schomers & Matzdorf, 2013). These different financing schemes to implement PES offer new opportunities to fund conservation efforts, especially in developing countries (Pattanayak et al., 2010).

There is also increasing interest in payment for water-related ecosystem services (PWES) as an instrument for watershed protection and management (Muñoz Escobar et al., 2013). The most common ecosystem services are water quality, quantity and flow regulation (Landell-Mills & Porras, 2002). One financing mechanism used by PWES schemes is the water fund, where water users invest money voluntarily to finance activities to conserve ecosystems in watersheds or river basins. Water funds focus on maintaining and conserving hydrologic services through the conservation and restoration of natural ecosystems (TNC, 2012). They allow downstream water users (buyers of water-related ecosystem services, or WES) to finance upstream conservation practices to improve WES. The water fund approach has created opportunities to engage different stakeholders using a trust fund financial model that is independently governed for long-term benefits – some for up to 80 years (Goldman-Benner et al., 2012). Such investments aim simultaneously to maintain ecosystem services and to improve human well-being of the upstream communities (Goldman-Benner, Benitez, Calvache, & Ramos, 2010). Water funds can be financed by both private and public sources. In recent years, private firms have become important actors in PES schemes (Koellner, Sell, & Navarro, 2010). However, what has been somewhat overlooked is their expectations about the financial and non-financial cost–benefit of investing in a water fund as a potential financing mechanism for the PWES scheme to conserve ecosystem services (Goldman-Benner et al., 2012; Koellner, Sell, Gähwiler, & Scholz, 2008; Sell, Koellner, Weber, Pedroni, & Scholz, 2006; Sell et al., 2007).

Therefore, understanding the decision-making behaviour of firms as investors in PES schemes will help us understand how they see the costs and benefits of ecosystem services in managing their production function. This study fills this gap by testing how applicable a water fund might be as an alternative financing mechanism for a PWES scheme. It uses a theory of planned behaviour to examine institutional decision-making behaviour that could inform decision makers and improve practices in PWES schemes. The willingness of firms to invest in a water fund as an alternative financing mechanism for a PWES scheme is quantified using a contingent valuation method (CVM)–style approach. Linking a firm's institutional decision-making behaviour and their willingness to invest in a water fund as an alternative financing mechanism of PWES schemes is the novelty of this article. We add to the limited literature by addressing the durability of PWES schemes from an institutional and valuation perspective and draw on research looking at the sustainability of the potential financing mechanisms for PES schemes.

Kenya's Lake Naivasha is a highly significant freshwater resource in an otherwise water-scarce area. It supports many important economic activities, including horticulture, tourism and geothermal power generation (Becht, Odada, & Higgins, 2005). Population

growth, the intensification of land use and the growth of formal and informal settlements are major challenges of the local socio-ecological systems (Mulatu, van der Veen, Becht, van Oel, & Bekalo, 2013). A group of firms around the lake, the Lake Naivasha Growers Group (LNGG), have started to address these challenges and since 2007 have financed a pilot PWES programme and conservation scheme which offers financial incentives to local upstream farmers to maintain water-related ecosystem services. This incentive does not cover the actual cost incurred by farm households (Mulatu, van der Veen, & van Oel, 2014). The programme is also supported by the Kenya World Wide Fund for Nature (Jones, 2006). However, there is still uncertainty regarding which factors contribute best to a successful financing mechanism for PWES programmes. Therefore, this study explores the potential of using a water fund as a possible financing mechanism for the PWES programme and estimates firms' willingness to invest in a water fund by considering a particular experiment in the Lake Naivasha basin.

The model

A general model of institutional decision-making behaviour, adapted from Ajzen (1991) and Koellner et al. (2010), is used to assess the willingness of firms to invest in a water fund as an alternative financing mechanism for the PWES scheme to improve WES. The theory of planned behaviour highlights the link between beliefs and behaviour (Figure 1a). This theory includes perceived behavioural control to improve the theory of reasoned action by Ajzen and Fishbein (1980). It makes a distinction between intention and behaviour (Ajzen, 1991). In economics, the distinction in decision making between intention and observable behaviour

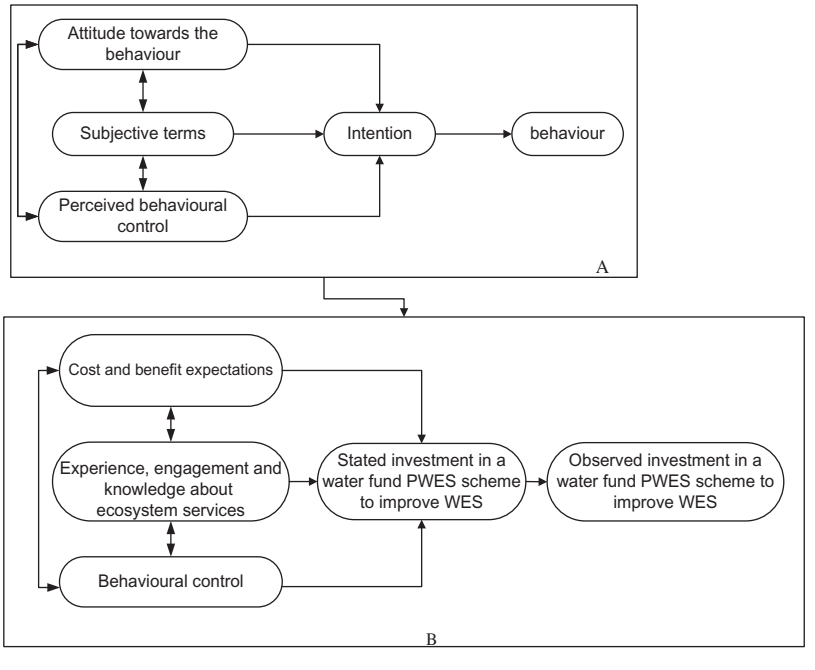


Figure 1. (a) The theory of planned behaviour. (b) General model adopted from the theory of planned behaviour to understand factors that influence the firms' decision-making behaviour to invest in a water fund as alternative financing for the payment for water-related environmental services (PWES) scheme.

has led to a discussion about the validity of stated-preferences techniques compared with revealed preferences for environmental valuation (Bateman et al., 2002; Koellner et al., 2010). Our assumption is that decision makers in a firm act as managers, as well as good citizens (Koellner et al., 2010). This assumption is also supported by Sagoff (1998) and by Russell, Bjørner, and Clark (2003), who state that decision makers typically base their decisions on environmental issues informed by community preferences, rather than an aggregation of individual ('selfish') preferences. The environmental efforts undertaken by individual decision makers are also affected by altruistic preferences (Weaver, 1996). We followed an approach similar to that of Koellner et al. (2010), using a general model of institutional decision making to assess the stated and observed investment in ecosystem services and derive the corresponding variables that influence a firm's decision-making behaviour to invest in a water fund as an alternative financing mechanism for the PWES scheme. A stated-preferences approach can be applied using these corresponding variables to assess the firm's decision makers' preferences to invest in a water fund. We use a stated-preference method or CVM to develop a valuation scenario according to Bateman et al. (2002) to estimate the firm's willingness to invest in a water fund as an alternative financing mechanism for the PWES programme to improve WES.

CVM is a direct method that questions a sample of the relevant population about how much money they would be willing to pay (WTP) or willing to accept (WTA) regarding the proposed interventions. It is sometimes referred to as a stated-preference method. It is called contingent valuation because the valuation is contingent on the hypothetical scenario put to the respondents (Perman, Ma, Mcgilvray, & Common, 2005). The resulting WTP or WTA is a measure of how much the respondent values the intervention (Grutters et al., 2008). Many economists consider that this approach suffers from the problem that CVM asks hypothetical questions, while indirect methods exploit data on observed, actual, behaviour. But CVM has an advantage over indirect methods as it deals with both use and non-use values, whereas the indirect methods only deal with use values. CVM responses regarding WTP or WTA can accept questions directly about monetary measures of utility changes (Mitchell & Richard, 1988). Critics of CVM allege that stated-preference data is inferior to observing revealed preferences, consider CVM a "deeply flawed method" for valuing non-use goods, and point to possible biases affecting contingent valuation data (Perman et al., 2005). Despite these criticisms, proper application of CVM can provide policy makers with valuable information to evaluate the benefits of different interventions (Anna & Joseph, 2000).

A decision maker's knowledge about the socio-economic conditions and ecosystem services and the firm's prior engagement and experience with PES may influence stated demand and investment intention. Behavioural control can support or hinder the transformation of stated demand into observable investment behaviour (Sell et al., 2007). Cost–benefit expectations can drive ecosystem services improvements, whether these are financial or non-financial (Koellner et al., 2010). Thus, whether a firm is willing to invest in a water fund as an alternative financing mechanism for the PWES scheme to improve WES can be understood by a framework encompassing: the cost–benefit expectations of firms; their experience and prior engagement; the decision maker's knowledge about ecosystem services; and behavioural control, which may support or hinder the decision to invest (Figure 1b). Detailed explanations of the corresponding variables that were extracted using the theory of planned behaviour for our analysis are presented in Appendix 1. These variables are identified as criteria because they are relevant for market actors dealing with ecosystem services and determine their decision-making behaviour to invest in ecosystem services (Koellner et al., 2008).

The valuation scenario, the PWES scheme and the institutional framework for the Lake Naivasha basin

A questionnaire containing a typical valuation scenario was prepared and distributed in person to either the owner or the general manager of each firm to assess their preferences concerning investing in a water fund and to estimate the willingness to invest in a water fund. The CVM instrument should meet the dual criteria of satisfying economic theory and the needs of respondents with a set of meaningful and understandable questions (Mitchell & Richard, 1988). The sequencing of questions was arranged according to Bateman et al. (2002), with a detailed introductory section and the main questionnaire. The introductory section included the valuation scenario, developed using the contingent valuation approach, for the themes of WES, a water fund, and the proposed financing mechanism and institutional framework of the PWES scheme. The geography of the Lake Naivasha basin is illustrated in Figure 2.

Water-related ecosystem services and the proposed financing mechanism for the PWES scheme in the Lake Naivasha basin

Lake Naivasha is a wetland of international importance, with rich biodiversity (Ramsar, 2011). Its natural resources support the national and the local economy (Becht et al., 2005). The ecosystem services provided by the Lake Naivasha basin have been seriously reduced in recent times. Its degradation, human activities, possible interventions and the effects of best management practices in selected sub-basins are summarized in Table 1. A pilot PWES scheme was designed and has been implemented since 2007 (WWF, 2011) to

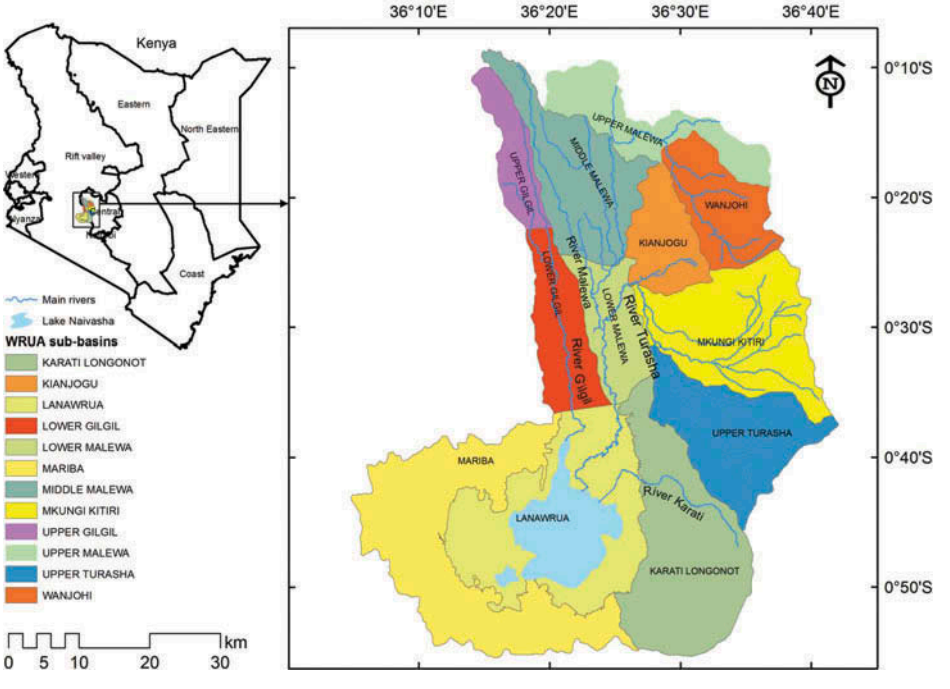


Figure 2. The Lake Naivasha basin, Kenya, its main rivers, and the sub-basins associated with the 12 water resource users associations (WRUAs).

Table 1. Indicators for the availability of good-quality freshwater, measurable variables, degradation extent, human activities, possible interventions and effects of best management practices (BMPs) in the Lake Naivasha basin.

Indicator for the availability of good-quality freshwater	Measurable variables	Extent of degradation	Human activity reducing ecosystem services	Possible interventions	Effects	Without BMPs in selected sub-basin (from Philip, 2008)	With BMPs in selected sub-basin (from Philip, 2008)
Sedimentation of the lake	Annual rate of sedimentation	>1 cm/year over the last decade (Stoof-Leichsenring, Junginger, Olaka, Tiedemann, & Trauth, 2011)	Unsustainable agricultural practices	Promote environment-friendly and erosion-avoiding agricultural practices Restoration of the degraded forest and riparian land	**Streamflow** Wanjohi sub-basin **Sediment yield** Wanjohi sub-basin Mkungi-Kitiri sub-basin	2.86 m^3/s 182.86 kg/acre 169.82 kg/acre	2.95 m^3/s 7.56 kg/acre 18.9 kg/acre
Quality of water in the lake	Turbidity indicators: total nitrogen, total phosphorus, chlorophyll-a, Secchi depth	Hypereutrophic, Secchi depth <0.50 m (Kitaka, Harper, & Mavuti, 2002; Ndungu et al. 2013)	Excessive use of fertilizers containing certain components	Promote proper use of fertilizers Provide information and education	**Total organic nitrogen yield/acre** Wanjohi sub-basin Mkungi-Kitiri sub-basin **Total organic phosphorous yield/acre** Wanjohi sub-basin Mkungi-Kitiri sub-basin	1156.40 kg/acre 188.93 kg/acre 300.74 kg/acre 94.48 kg/acre	30.87 kg/acre 66.82 kg/acre 9.44 kg/acre 37.26 kg/acre

(*continued*)

Table 1. (*Continued*).

Indicator for the availability of good-quality freshwater	Measurable variables	Extent of degradation	Human activity reducing ecosystem services	Possible interventions	Effects	Without BMPs in selected sub-basin (from Philip, 2008)	With BMPs in selected sub-basin (from Philip, 2008)
Volume of water in the lake that is available for use	Lake level, lake volume, thresholds from water abstraction points (De Jong, 2011)	Lake level ~ 4–5 m below natural levels (Becht & Harper, 2002, van Oel et al., 2013)	Excessive use of water for irrigation	Stimulate more efficient methods of irrigation Enforce the rules and regulations for water use Promote more efficient water use and harvesting technologies			

help rehabilitate the basin ecosystem services. The beneficiaries of the WES pay or invest to support interventions that can better assure or enhance and improve the WES (in this case, the availability of good-quality freshwater) while at the same time supporting the livelihoods of local farmers (rural upstream local communities) by a compensation or reward for the interventions they conduct. An overview of water-related ecosystem services in the Lake Naivasha basin context is given in Appendix 2.

Currently, a sustainable development programme and the restoration of ecosystem services in the Lake Naivasha basin are coordinated by the Imarisha Naivasha (Empower Naivasha) programme (Gherardi et al., 2011). In 2011, the Kenyan government launched this programme as an umbrella organization to coordinate local industries, communities, government agencies and NGOs in an effort to restore and maintain the Lake Naivasha basin ecosystem services (Imarisha Naivasha Trust, 2012). The Water Act of 2002 (KLR, 2002) recognizes the need for stakeholder participation for effective water resource management. The Lake Naivasha basin comprises 12 sub-basins, each with a water resource users association (WRUA) (WRMA, 2010). Sub-catchment management plans are developed by all WRUAs, with their major objectives being to improve water availability and water quality; to improve the degraded catchment and riparian areas; and to enhance the livelihoods of the local people.

The Lake Naivasha Water Resource Users Association (LANAWRUA) is one of the 12 WRUAs which are already buyers of WES in the basin. This pilot programme is financed by the LNGG and supported by the Kenya World Wide Fund for Nature. A total of 36.6 ha of individual farmland in the upstream basin is under conservation through the pilot PWES programme (Chiramba, Mogoi, Martinez, & Jones, 2011). A reliable financial mechanism is one requirement to sustain the programme at the basin level, and the Lake Naivasha Water Fund has been proposed as a potential solution to support the PWES scheme. The fund will be mobilized from all members of the WRUA sub-basins to invest in specific interventions to ensure WES at the basin level. The Water Resource Management Authority is also supporting the programme by allocating funds from the Water Services Trust Fund (WWF, 2011). A summary of the current and the proposed new PWES programme through a water fund as an alternative financing mechanism approach is presented in Appendix 3. The hydrologic impacts of different land uses and conservation practices vary according to local conditions of the basin. The effects of best management practices in the upstream parts of the Lake Naivasha basin for the availability of good-quality freshwater in Lake Naivasha were presented to the respondents to gain their support (Philip, 2008).

Proposed institutional framework for the PWES scheme for the Lake Naivasha basin

Applying a framework to promote institutional sustainability in a PWES scheme can help identify the conditions relevant for creating robust and enduring institutions between ecosystem service providers and ecosystem services beneficiaries (Muñoz Escobar et al., 2013). Using the pilot institutional framework for the PWES scheme in the Lake Naivasha basin (Chiramba et al., 2011; WWF, 2011), an improved institutional framework was designed to incorporate a water fund as a potential financial mechanism for the PWES scheme. The WRUAs are organized formally and voluntarily to achieve the cooperative sharing, management and conservation of their common water resource (WRMA, 2010). Intermediaries play a negotiation role between WES buyers and sellers and provide a forum for discussion between WES buyers and sellers (Landell-Mills & Porras, 2002; Swallow et al., 2009). There are verifiers who control and monitor the water, land and forest resource conservation practices providing WES.[1] These verifiers

comprise representatives from the WES buyers and sellers, as well as intermediaries who oversee the transparency of transactions and assure their credibility. Presenting the institutional framework to respondents in the valuation scenario enabled us to understand factors that support or impede their decision to engage in a water fund as an alternative financing mechanism for the PWES scheme to support the programme (i.e. the perceived behavioural control).

Method

Questionnaire, sample survey and variables

A survey of business firms was conducted during August and September 2012. The questionnaire (available in the online supplemental data, at http://dx.doi.org/10.1080/02508060.2015.1050580) gathered data about the factors which influence each firm's willingness to invest in a water fund as an alternative financing mechanism for the PWES scheme. A stratified and random sampling technique was used to select firms located directly around Lake Naivasha (Appendix 4). All the firms in our sample are private, except for the clean water supply companies and one of the energy (power) companies, which are parastatals. Consultative meetings with representatives of the stakeholders were conducted prior to the face-to-face survey to understand their interest in participating in a PWES programme and, in particular, to gauge their interest in investing in a proposed water fund as an alternative financing mechanism for the PWES scheme. The questionnaire, which is discussed in detail in the previous section on the valuation scenario, the PWES scheme and the institutional framework for the Lake Naivasha basin, provided the respondents with useful information.

The main part of the questionnaire contained questions about the respondent's knowledge of relevant socio-economic and environmental aspects of the basin; the experience and prior engagement of the firm in ecosystem services management; their willingness to invest annually in a Lake Naivasha Water Fund; the expected cost–benefit of investing in a water fund as an alternative financing mechanism for the PWES scheme; and factors that might influence the decision to invest in a PWES scheme. The expected costs and benefits of investing in a water fund as an alternative financing mechanism for the PWES scheme were presented to respondents on a Likert scale ranging from 1 (not true at all or low) to 7 (very true or high). The firm's likely future engagement in improving ecosystem services was included, also stated on a Likert scale from 1 (no engagement at all) to 7 (high level of engagement). Similarly, the respondent's knowledge of relevant socio-economic and environmental aspects of the basin was interrogated, again on a Likert scale from 1 (very low level of knowledge) to 7 (very high level of knowledge). The institutional framework, location and compensation factors that influenced their likely decision to invest in a water fund as an alternative financing mechanism for the PWES scheme were indicated on a scale from −5 (negative influence) to +5 (positive influence).

Methods of data analysis

The data were analyzed using statistical methods. The theory of planned behaviour allowed us to extract various corresponding variables to assess each firm's engagement and the factors influencing their decision to invest in a water fund. A principal component analysis (PCA) was used with eigenvalue > 1 (Kaiser-Gutmann retention criterion) as the cut-off criterion, together with varimax rotation and Kaiser normalization (Field, 2005; Jackson, 1993). Different studies have applied different rules of thumb for the minimum

factor loading of an item in PCA (Field, 2005). Tabachnick and Fidell (2011) recommended greater than 0.32 factor loading (which explains 10% of the variance); Costello and Osborne (2005) recommended greater than 0.5 factor loading. We used 0.5 as the minimum factor loading in our analysis.

Results and discussion

Respondents' knowledge and firms' level of engagement in improving ecosystem services

The respondent's levels of knowledge of the socio-economic and ecosystem aspects of the Lake Naivasha basin were evaluated. The results are presented in Figure 3 for both large-scale farms and other firms around the lake. Large-scale farms have greater knowledge about the PWES scheme and social aspects than decision makers in other firms. This might be explained by the fact that the pilot PWES scheme is financially supported by the interest groups of the LNGG, comprised of the large-scale farms around the lake. They have been trying to closely monitor the basin environmental conditions (e.g. rainfall, lake level and temperature) on which their success depends (van Oel et al., 2013; WWF, 2011). Also, the same decision makers have a higher level of knowledge and understanding about the social aspects of the basin because they employ many of the people who live around the lake.

The firms' prior level of engagement in improving ecosystem services was also evaluated (Figure 4). The results show that large-scale farms had a higher level of engagement with improving water quality and landscape beauty, followed by water availability. Other firms had a similar level of engagement in improving water availability, landscape beauty and biodiversity. In the basin, the level of engagement in carbon trading is low and restricted to geothermal companies (i.e. power industries). These results indicate that the prior engagement of firms and the decision makers' knowledge about socio-economic and ecosystems have a significant impact on interventions for sustainable management of the basin socio-ecological systems.

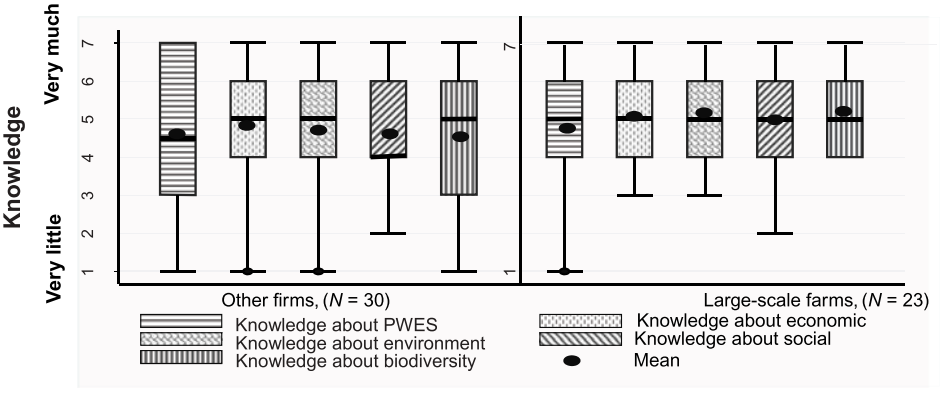


Figure 3. Respondents' knowledge of the PWES programme, environment, biodiversity, economic and social aspects of the Lake Naivasha basin (boxplots with median and percentiles) for large-scale farms and other firms (i.e. hotel and tourism business, energy and clean water supply companies, and ranches).

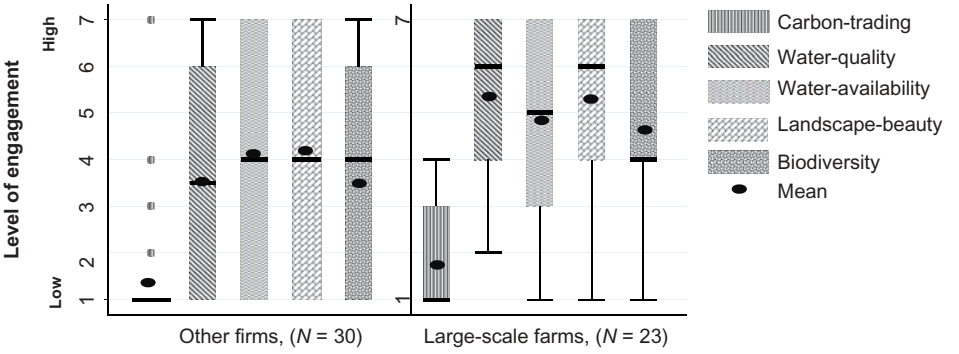


Figure 4. Firms' level of engagement in improving ecosystem services in the Lake Naivasha basin (boxplots with median and percentiles).

Firms' willingness to invest in a water fund

The firms' stated willingness to invest in a water fund as an alternative financing mechanism for the PWES scheme and the certainty of their decision to invest are presented in Table 2. The willingness to invest is expressed in Kenyan shillings (KES) per year. While conducting our survey, the exchange rate was around USD 1 to KES 84. Energy companies exhibit the highest willingness to invest, followed by ranches and large-scale farms. The estimated total willingness to invest in a water fund as an alternative financing mechanism for the PWES scheme was about KES 9.4 million per year, where the firms were approximately 58% confident in their decision to invest. This result indicates that business firms are indeed potentially interested in funding a PWES programme through a water fund. The findings suggest that a water fund could be seriously considered as a potential financing mechanism for the PWES scheme in the Lake Naivasha basin. This study also illustrates that valuing investment in a water fund to improve ecosystem services could be included as an input in the production function of individual firms.

Table 2. Firms' willingness to invest in a water fund as an alternative financing mechanism for the payment for water-related ecosystem services scheme to improve water-related ecosystem services in the Lake Naivasha basin. (WTI = willingness to invest, in KES/y.)

Business firms	Mean WTI (A)	WTI standard deviation (B)	Certainty (C)	Firms responding (D)	Total no. of firms (E)	Total WTI in water fund (A × E)
Large-scale farms	77,326	15,442	57%	23	78	6,031,428
Hotel and tourism business operators	11,521	3,253	58%	23	69	794,949
Ranches	93,333	34,801	75%	3	13	1,213,329
Water supply companies	15,000	5,000	25%	2	2	30,000
Energy generation and supply companies	350,000	150,000	75%	2	2	700,000
Average WTI in a water fund for all firms surveyed	57,613	12,264	58%	53	164	**9,448,532**

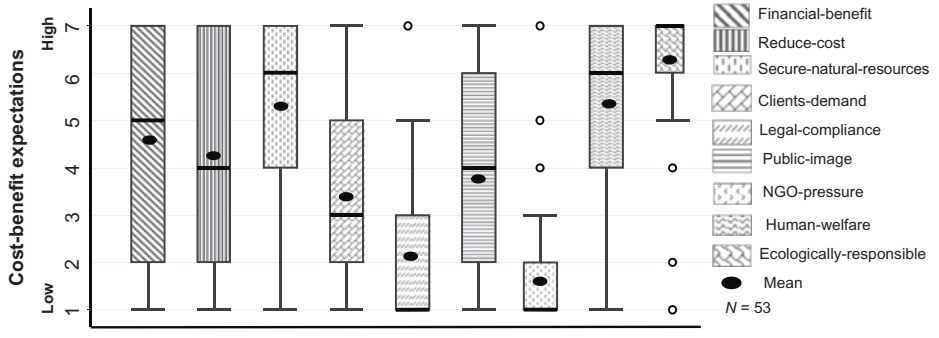
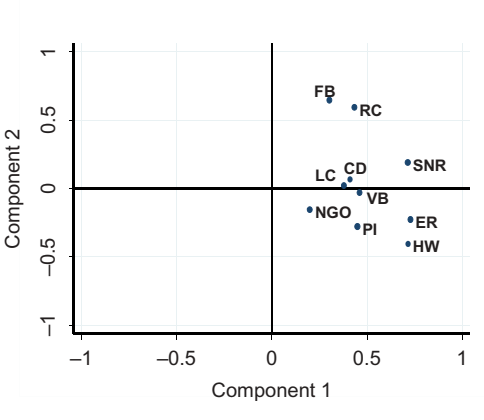


Figure 5. Cost–benefit expectations for investing in a water fund as an alternative financing mechanism for the payment for water-related environmental services scheme (boxplots with median and percentiles).

Cost–benefit expectations of firms from investing in a water fund as an alternative financing mechanism for the PWES scheme

Figure 5 presents the firm's cost–benefit expectations from investing in a water fund as an alternative financing mechanism for the PWES scheme to improve WES. The median of the cost–benefit expectation was highest for Ecologically responsible, Improving human welfare and Securing natural resources (i.e. the non-financial cost–benefits). This was followed by Investing in a water fund to reduce direct financial cost and Create a direct financial income (i.e. the financial cost–benefits). Improving public image, which is an indirect financial benefit, had a moderate impact on firms' expectations. The lowest median score involved the features of Legal compliance and NGO pressure. Thus the non-financial expectations motivate the firms to invest in a water fund more than the financial factors do.

PCA was also used to assess the cost–benefit expectations of investing in a water fund. Two components that have an eigenvalue > 1 and that cover more than 70% of the proportions are presented in Figure 6. Component 1 had the highest factor loadings for



Cost-benefit expectations	Components	
	1	2
Eigenvalue	2.60	1.13
Financial-benefit (FB)	0.30	0.64
Reduce-cost (RC)	0.43	0.59
Secure-natural resources (SNR)	0.71	0.19
Client-demand (CD)	0.41	0.06
Legal-compliance (LC)	0.37	0.01
Public-image (PI)	0.45	–0.28
NGOs-pressure (NGO)	0.20	–0.15
Voluntary-basis (VB)	0.46	–0.03
Ecologically-responsible (ER)	0.71	–0.40
Human-welfare (HW)	0.72	–0.22

Figure 6. Component plot from principal component analysis of cost–benefit expectations of investing in a water fund.

non-financial cost–benefit expectations of improving human welfare; being ecologically responsible; and securing a firm's natural resources. Component 2 had the highest loadings for direct financial cost–benefit expectations with respect to reducing firm cost and creating direct financial income. The indirect financial cost–benefit expectations (i.e. NGO pressure and legal compliance) were not important as motivating factors. Although firms are compelled in a business environment, the PCA results also confirmed that the non-financial cost–benefit expectations are rated higher as motivators for investing in a water fund as an alternative financing mechanism for the PWES scheme than the financial cost–benefit expectations. These results support the findings of Koellner et al. (2010), which showed the high importance of non-financial benefit expectations of firms for investing in tropical forest ecosystem services above the financial value of ecosystem services and led to recommendations to improve scientific and practical knowledge as an input to the production function of firms. In other words, the altruistic preferences of decision makers do motivate investment decisions on ecosystem services improvements. As a result we propose that measuring the willingness to invest in a water fund could enable firms to include this investment as an input into their production function.

Behavioural control factors that determine a firm's decision to invest in a water fund

The institutional arrangements for implementing the PWES scheme are considered as behavioural factors that potentially determine a firm's decision to invest in a water fund as an alternative financing mechanism (Figure 7). The institutional arrangement under the PWES scheme is a contractual agreement to improve WES between the ecosystem services providers ('sellers') and beneficiaries ('buyers'). The nature of the institutional arrangement either supports or impedes the decision to participate in the programme (Muñoz Escobar et al., 2013). The results indicate that the presence of verifiers in the institutional framework of the PWES scheme and in-kind compensation and/or reward payments for WES providers had a very positive influence and were highly important factors in their decision to invest in a water fund. The presence of intermediaries and the project location had a moderate influence on their decision. The decision to invest in a

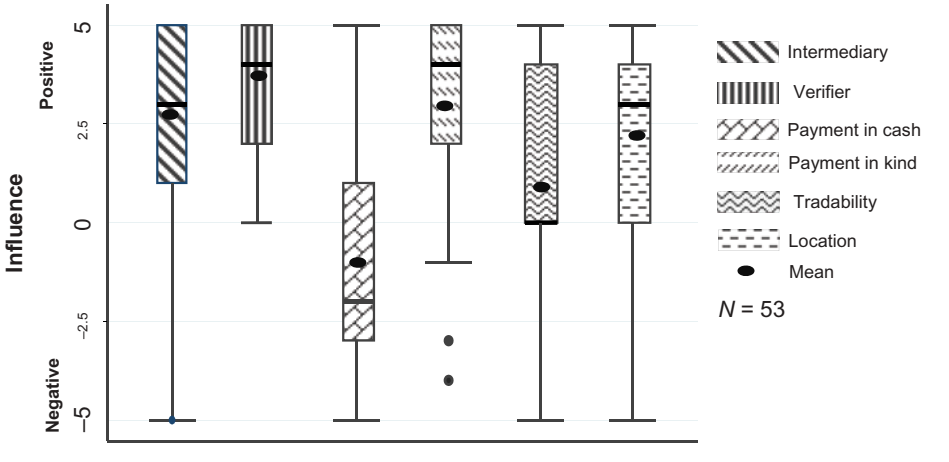


Figure 7. Institutional framework, location and compensation factors that influence the decision to invest in a water fund as an alternative financing mechanism for the payment for water-related environmental services scheme (boxplots with median and percentiles).

water fund was influenced negatively if the compensation and/or reward payments for service providers were in cash. People were indifferent with regard to the exchanging or tradability of the compensation or rewards. This suggests that in-kind compensation schemes are preferred to cash compensation schemes.

Despite criticisms, a CVM approach has formed the basis for a significant amount of decision making in developed and developing countries for different interventions to improve ecosystems (Anna & Joseph, 2000). Indeed, CVM studies have been optimized to survey citizens (Koellner et al., 2010). In our study the CVM approach proved its usefulness when implemented jointly with institutional decision-making approaches, particularly with the theory of planned behaviour to understand firms' decision-making behaviour to invest in ecosystem services. In contrast to valuation studies aimed at citizens to establish the total economic value of ecosystem services, our study focused on the demand of firms and in extracting factors that can highlight their intention to invest in ecosystem services. Therefore, the impact of institutional arrangements on a firm's decision to invest in ecosystem services is fundamental to consider for the long-term success and sustainability of PWES programmes.

Conclusion

The main objective of this study was to assess the willingness of firms to invest in ecosystem services improvements via a water fund finance mechanism to support the conservation interventions of PWES schemes. This study investigated the preferences of firms with respect to investing in a water fund as an alternative financing mechanism for a PWES scheme to improve WES. This is in contrast to other studies which have looked at the preferences of individuals or citizens to estimate the total economic value of ecosystems. The valuation scenario for a water fund to improve WES using a contingent-valuation-style approach was presented to decision makers of firms to test the applicability of a water fund in the Lake Naivasha basin in Kenya. This study provides insight into the willingness of market actors (i.e. business firms) that play an important role in establishing finance mechanisms for interventions that seek to improve ecosystem services. The knowledge of firms' decision makers about socio-economic and ecosystem conditions and the prior engagement of firms with efforts to improve ecosystem services have a substantial impact on their willingness to invest in ecosystem services.

The results indicate that non-financial outcomes are more influential than financial cost–benefit when firms consider whether to invest in a water fund as an alternative financing mechanism for a PWES scheme. In other words, the altruistic preferences of decision makers motivate the investment decision on ecosystem services improvements. The findings also indicate that the institutional arrangements of implementing the PES programme potentially determine a firm's decision. The study concludes that measuring their willingness to invest in a water fund can help firms decide whether to include this investment as an input to their production function. As such, a water fund can be regarded as a possible financial mechanism in PWES programmes, and this raises the chances that conservation funding can be increased. Moreover, financing conservation efforts through a water fund could create a financially sustainable PWES model and engage different stakeholders to pool their investments in ecosystem services.

Acknowledgements

We are very grateful to the chairmen of the Lake Naivasha Water Resource Users Association, who helped us arrange visits and meetings with local firms. We are also grateful to the Lake Naivasha Growers Group, the Kenya World Wide Fund for Nature sub-regional office in the Lake Naivasha basin, and the business firms' owners, managers and staff members for their boundless support during our surveys and data collection. We are also extremely grateful to the anonymous reviewers for their constructive comments.

Funding

This research was financed by the Netherlands Organization for Scientific Research, WOTRO Science for Global Development (NWO/WOTRO).

Supplemental data

Supplemental data for this article can be accessed http://dx.doi.org/10.1080/02508060.2015.1050580

Note

1. The proposed compensation/reward payment mechanism for WES sellers is Kenyan shillings, either in cash or in kind.

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Appendix 1. Constructs and corresponding variables.

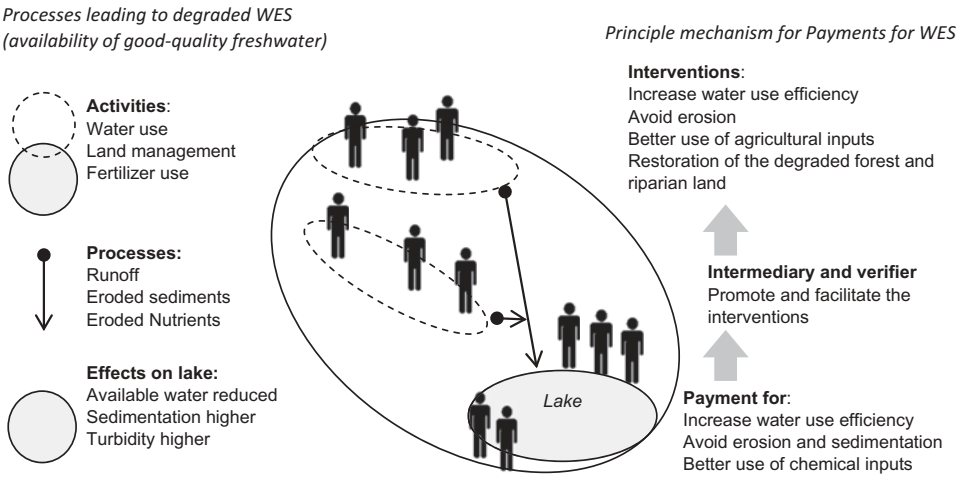
Construct	Variable	Explanation of factors affecting willingness to invest in a water fund as an alternative financing mechanism for the Lake Naivasha payment for water-related ecosystem services (PWES) programme to improve water-related ecosystem services	Variable name
Cost–benefit expectations	Expected cost–benefit of engaging in a PWES scheme and investing in a water fund		
	Direct financial benefits	The availability of good-quality water year-round creates a net financial income for our firm	Financial-benefit
		The availability of good-quality water year-round reduces costs for our firm	Reduce-cost
		Our firm is active in this field due to client demand	Client-demand
	Indirect financial benefits	Our firm does mandatory compensation for legal compliance	Legal-compliance
		Our firm expects image benefits in the public	Public-image
		Our firm perceives high pressure from NGOs	NGOs-pressure
		Our firm wants to compensate the benefit of ecosystem services on a voluntary basis	Voluntary-basis
	Non-financial benefits	Our firm wants to act ecologically responsible	Ecologically-responsible
		Our firm wants to contribute to human welfare	Human-welfare
		The availability of good-quality water year-round ensures our company's natural resources	Secure-Natural resources
Experience	Decision makers' knowledge about, and firm's experience and prior engagement in, ecosystem services	Decision makers' knowledge about socio-economic and ecosystem services conditions	Knowledge
		Firm's prior engagement and experience in improving ecosystem services	Engagement

(*continued*)

Appendix 1. (*Continued*).

Construct	Variable	Explanation of factors affecting willingness to invest in a water fund as an alternative financing mechanism for the Lake Naivasha payment for water-related ecosystem services (PWES) programme to improve water-related ecosystem services	Variable name
Behavioural control	Factors that influence the decision to invest in water funds and engaging in supporting a PWES programme		
	Existence of intermediary in the programme	Intermediaries are to play a negotiation role between WES buyers and sellers and providing a forum for WES buyer–seller discussion	Intermediary
	Existence of verifier in the programme	A verifier controls and monitors the sustainable management of water, land and forest resources and of WES improvements	Verifier
	Location of the programme to be implemented	The parts of the basin where the PWES programme has been proposed to be implemented	Location
	Tradability of the certificates for ecosystem service providers	WES sellers' payment certificates (vouchers) to be tradable	Tradability
	Mode of payment in cash	WES sellers' payment certificates (vouchers) to be in cash	Payment in-cash
	Mode of payment in kind	WES sellers' payment certificates (vouchers) to be in kind	Payment in-kind
Stated investment in a water fund as alternative financing mechanism for PWES scheme per year	Willingness to invest in Lake Naivasha water fund as an alternative financing mechanism for PWES scheme for availability of good-quality freshwater year-round	The amount of money the firm is willing to invest/ pay into a water fund as an alternative financing mechanism for PWES scheme per year	WTI

Appendix 2. Overview of water-related ecosystem services in the Lake Naivasha basin context.



Appendix 3. The current and proposed payment for water-related ecosystem services (PWES) schemes for the Lake Naivasha basin.

Programme element	Current	Proposed
Funding sources	WWF Kenya and Lake Naiasha Growers Group	All WRUA members, individuals, flower and horticulture farms, hotels, energy companies, water supply companies, and tourism business operators
Contract agreement period	1 year	5 years
Financing mechanisms	Voluntary donations and contributions	Lake Naivasha Water Fund
Intervention areas	Wanjohi and Upper-Turasha-Kinja WRUAs	All WRUAs in the Lake Naivasha basin

Appendix 4. Firms around Lake Naivasha.

Type	Number of firms[1]	Questionnaires distributed	Responses
Large-scale farms[2]	78	34	23
Hotels and tourism business operators	69	28	23
Ranches[3]	13	6	3
Clean water supply companies	2	2	2
Energy (power) companies	3	2	2
Total	165	72	53

[1]The number of firms was given by the Municipal Council of Naivasha.
[2] Large-scale farms are flower and horticultural farms, mainly for the export market.
[3] Ranches are involved in wildlife-friendly private conservancies and livestock production.