Land Use Policy xxx (2014) xxx–xxx

Contents lists available at ScienceDirect

Land Use Policy

journal homepage: www.elsevier.com/locate/landusepol

Shared ecological knowledge and wetland values: A case study

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ARTICLE INFO

Article history:
Received 15 January 2013
Received in revised form 30 March 2014
Accepted 9 April 2014

Keywords:
Wetlands
Ecosystem services
Ecological functions
Public goods
Multiple motivation analyses
Perceived utility

ABSTRACT

The estimation of wetlands' non-use values to build up a total economic evaluation can be based on stated preference methods, which derives from the standard economic model that assumes a rational assessment of the consequence of preferences on personal utility. The paper describes the nature of the citizens' shared ecological knowledge of wetlands functions, the relation of the shared ecological knowledge with the official/normative knowledge, and the relation between the motivations outlined by the shared ecological knowledge and those expected by the standard economic model. The results demonstrate that economic preferences are driven by multiple motivations well rooted in the social nature of shared ecological knowledge, and not by simply consequential motivations. In this case study, social knowledge of wetlands' ecological functions is proportionally related to people's living proximity to those wetlands. Unexpectedly, shared ecological knowledge of historically well-known and critically important services, like the hydraulic and hydrologic services, has also been diminishing. Furthermore, there is a partial or clear-cut separation between official/normative knowledge and the shared ecological knowledge on crucial aspects like wetlands' climate change role. This approach helps to construct a motivational framework to derive values that are useful as long as they allow accounting for a complex socio-cultural capital in the public decision making process.

Introduction

In the first half of the 20th century wetlands were perceived by several social groups as noxious areas hampering economic development and landscape exploitation (Boyer and Polasky, 2004). These beliefs brought about the destruction of a great part of these ecosystems, but in recent decades their perception has changed dramatically. The Ramsar Convention on wetlands (UNESCO, 1971) was an example of this change.

Wetlands perform multiple functions that in turn produce multiple benefits (Table 1; see Brander et al., 2006; Costanza et al., 1997; Millennium Ecosystem Assessment, 2003, 2005), among them biodiversity, rather difficult to measure (Hamilton, 2005; Battisti and Contoli, 2011) and to place in the ecosystem services framework, being either an intermediate service, or a final service, or good generating a use value, or a good generating non-use value (Brouwer et al., 2013). Wetlands may also produce some benefits competing with those produced by engineering systems, e.g. wastewater treatment systems (Kadlec and Knight, 1996; Mannino et al., 2008). Despite this official scientific and normative ecological knowledge, the number of wetlands is still diminishing, partly because the wetland functions they generate are not associated with some recognizable monetary values (TEEB, 2009). For these reasons the economic valuation of environmental resources is an increasingly common practice, meant as the monetary quantification of the benefits (or costs) resulting from the preservation (or the destruction) of an environmental resource (Adams, 1993; Hanemann and Kanninen, 1999).

This paper comes from a wider research work used by the Province of Rome (Italy) to define a set of total economic values for a corresponding set of ecological systems (wetlands, woods, rural landscape) of its territory. Total economic value is the total amount of resources that citizens would be willing to forego for an increased amount of ecosystems services (Turner et al., 2003). The non-market components of the total economic values were estimated by means of stated preference methods like contingent valuation, that is one of the widely usable method to estimate the individuals willingness to pay (WTP) for ecosystem services in a credible proposed market (Bateman et al., 2002; Pagiola et al., 2004). These total economic benchmark values have been made public (http://websit.provincia.roma.it:8080/Benicomuni) to stimulate their use by community (public/private, economic/social) actors in all allowed negotiations or transactions.

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http://dx.doi.org/10.1016/j.landusepol.2014.04.007
0264-8377/

Table 1
Description of the first two sections of the questionnaires. The second section lists the wetlands ecological functions/benefits as stated by scientific/normative ecological knowledge to what respondents were asked to comment on.

	Section 1	
Wetlands		
This survey is part of a wider research project on the of the Rome County and the Lazio Region.		
Wetlands are low depth water areas like lagoons, deltas, marshes, ponds, etc.		Follow up
	Section 2	
Express your opinion about these statements		
1.	Wetlands are important as water reservoirs and circulation control	Total agreement; agreement; uncertainty; disagreement total disgreement
2.	Wetlands contribute to control green house gases based on C (like CO_2) and climate change sequestering organic matter (that is plant, animal, litter, sediments)	Total agreement; agreement; uncertainty; disagreement total disgreement
3.	Wetlands contribute to reduce environmental risks acting as a barrier against wind, waves, fires and erosion	Total agreement; agreement; uncertainty; disagreement total disgreement
4.	Wetlands have a water purifying function	Total agreement; agreement; uncertainty; disagreement total disgreement
5.	Wetlands contribute to biodiversity offering a habitat of several plants and animals (fishes, shellfish, water birds, mammals, reptilians)	Total agreement; agreement; uncertainty; disagreement total disgreement
6.	Wetlands have a recreational function (visits, wildlife watching, and game)	Total agreement; agreement; uncertainty; disagreement total disgreement
7.	Wetlands yield several categories of economic goods (wood, cane, fish, game, etc.).	Total agreement; agreement; uncertainty; disagreement total disgreement

This work focuses on the analyses of the citizens' shared knowledge of wetlands ecological functions used in a contingent valuation approach, because this kind of knowledge – overlapped with the official (e.g. scientific/normative) knowledge – is supposed to inform the individual preferences expressed by WTP, as assumed by the utilitarian philosophy that underpins the standard economic model.

We examined in depth this aspect because we assumed that the use of monetary estimates in public decision making about land use policy – especially in a concrete case – is only sustainable as long as it is explicitly connected to the socio-cultural complex capital which generate them.

Shared knowledge is defined as a cumulative body of knowledge and beliefs shared in the community by cultural transmission that, for these reasons, become social memory (Berkes et al., 2000; Davidson-Hunt and Berkes, 2003).

Even if not always with brilliant results (Diamond, 2005), social memory has historically, and all over the world, structured the local communities' decision making processes in ecosystems and landscape management (Franco et al., 2007; Horstman and Wightman, 2001). Therefore its loss represents a problem.

The shared ecological (or cultural: Orcherton, 2012) knowledge is a dynamic entity able to register changes and based on what has been learnt from trial and error management practices. For all these reasons this kind of social capital is more and more used by means of participatory approaches even in rural development programs (Anegbeh et al., 2004) or in natural resource research and programs (Castello et al., 2009; MacDonald and Weber, 1998; Rist et al., 2010; Shen and Tan, 2012).

The aim of the paper is to analyze: (i) the nature of the community citizens' knowledge of wetland ecological functions; (ii) the relation of the citizens shared knowledge with the scientific official knowledge, (iii) the relation between the motivations outlined by this shared knowledge and those expected by the standard economic model in ecological services' preference; (iiii) the role of the obtained results in land use policy decision making.

Materials and methods

The Rome region occupies the flat area of the Tiber Valley and the Tyrrhenian Sea, and was characterized by a widespread coastal wetland system that disappeared after the "great reclamation" during the first half of the XIX century. This large scale reclamation was a modernist project with a high ideological charge in the design of a new landscape (Renes and Piastra, 2011) and had a strong impact on local communities (Caprotti, 2008). A recent national wetlands inventory (http://sgi2.isprambiente.it/zoneumide/) led by the Mediterranean Wetland Initiative identified 24 wetlands covering 9302.79 ha. These wetlands were mainly classified as inland type, with a mean and median values of 387 and 65 hectares respectively. A remnant of the ancient coastland wetland system (Torre Flavia) is a protected area of international conservation concern and a Long Term Ecological Research Station (Battisti et al., 2008). Considering that the aim of this research was not site-specific, our survey regarded the whole province system of wetlands.

The survey was carried out during the summer of 2010: 81 respondents were interviewed in the pre-test and 537 in the true test.

A questionnaire was designed (i) to depict the relation between sample individuals profile and shared knowledge/awareness about wetlands ecological functions, (ii) to reduce the biasing factors of the CV method, e.g. starting point, scenario rejection, free-riding (Franco and Luiselli, 2013).

The 1st section of the questionnaire proposed the rationale for the interview to reduce interviewee weariness, expressed by the research aim of the interview and the importance of the respondent role in this research. Then a complete yet simply defined definition of wetland, with a follow up phase to clarify possible doubts (that nobody had).

In the 2nd questionnaire section the interviewers proposed a list of careful syntheses of the range of wetland functions loading services and associated socio/economic benefits as classified by scientific/normative ecological knowledge (Brander et al., 2006; Costanza et al., 1997; Leschine et al., 1997; Millennium Ecosystem Assessment, 2003, 2005). The wetland ecological services were carefully described as separated statements that respondents were asked to comment on a five point Likert scale. The statements were formatted in an easily understandable way, balancing simplicity, clarity and time requested to the respondent (Table 1).

In this way we defined a robust scenario for each respondent to activate a personal cognitive map of wetlands ecological knowledge and correspondent benefits.

Given that in this region wetlands no longer have detectable direct economic use values, we must assume that: (i) the relationship between the individual level of agreement/disagreement and the knowledge uncertainty about the stated functions/benefit represents the individual level of information motivating the citizen behavioral preferences; (iii) the individual motivations for the

Please cite this article in press as: Franco, D., Luiselli, L., Shared ecological knowledge and wetland values: A case study. Land Use Policy (2014), http://dx.doi.org/10.1016/j.landusepol.2014.04.007