Marine Pollution Bulletin 131 (2018) 151–162

Contents lists available at ScienceDirect

Marine Pollution Bulletin

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

The impact of a public information campaign on preferences for marine environmental protection. The case of plastic waste

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ARTICLE INFO

Keywords:
Plastic waste
Public information campaign
Value of information
Stated preferences
Choice experiment

ABSTRACT

This paper evaluates the effectiveness of a public information campaign, which was conducted on a major Greek Island (Syros), aimed at reducing plastic waste - and specifically plastic bags - in the local coastal/marine environment. A choice experiment was conducted to evaluate the effects on individual preferences for reducing plastic waste pollution under different status of environmental awareness, after the information campaign. The evaluation process was quite independent of the information campaign. Two samples of respondents were taken; one consisting of participants in the environmental campaign and the other consisting of non-participants. The results show: (a) significant differences between the preferences of the two samples; (b) variations in the willingness to pay values between the two samples for protection of the coastal/marine environment, but; (c) not significant differences in their commitment to take action (i.e. in their willingness to alter their current plastic bag use behavior).

1. Introduction

Environmental valuation methods based on revealed and stated preference have already been widely applied to assign values to ecosystem services. An inherent limitation in the evaluation of ecosystem services is the limited knowledge and experience of individuals of ecosystem functions and the processes underlining the provision of ecosystem services. The focus of the present study is on how people's preferences and values change when further (additional) information is provided to them concerning: the function of ecosystems; environmental impacts; environmental quality; and risk. This kind of information focuses on the core characteristics and properties of ecosystems: sustainability, resilience and the intergenerational welfare (Mavrommati et al., 2016; Bithas, 2008). The focus of our study extends beyond the so-called “information bias”, examining how environmental values, held by individuals, change according to different levels of information provided within the valuation studies and entailed in instant effects. Our study examines the effects on preferences induced by broad extended public information campaigns and awareness raising policies usually designed to enhance knowledge, to raise awareness and to increase commitment to specific environmental actions/programs (Bikhchandani et al., 2013; Marschak and Miyasawa, 1968; Marschak and Radner, 1972; Samples et al., 1986; Bergstrom et al., 1990).

With regard to environmental valuation studies, most of them tried to estimate the effects of the information provided during the study; information provision was an instant component of the valuation process. The main reasoning was that more and better information makes respondents' Willingness to Pay (WTP) rigid (Randall, 1986). Various statistical and econometric models were used to estimate this information effect, mainly by comparing the stated values (WTP) before and after the provision of environmental information. In most cases, when further information on the environmental impact of the selected activities is provided to individuals, environmental values are positively influenced and this is usually reflected in higher WTP estimates for environmental protection (Lusk, 2003; Urama and Hodge, 2006; Moynihan and Hawes, 2012; Schoenefeld and McCauley, 2016). Furthermore, knowledge about native ecosystems coupled with value congruent information on the benefits of environmental protection, has been found to increase the acceptability of environmental management strategies (Ribe, 1999; Bateman and Mawby, 2003; Ford et al., 2009; Ryan, 2012; Rambonilaza and Brahic, 2016).

The effects of information may differ across studies, depending on several factors such as: the choice between focus groups and individual interviews, the composition of focus groups (e.g. focus groups can be determined to better represent specific populations of interest), the content of the information that is provided and the different scales of

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https://doi.org/10.1016/j.marpolbul.2018.04.002
Received 12 October 2017; Received in revised form 2 April 2018; Accepted 2 April 2018
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the assessment (i.e. national, regional or local level) (Foster and Just, 1989; Krieger and Hoehn, 1999; Hill and Daniel, 2007; Shwom et al., 2008; Luthe and Schläpfer, 2011; Schoenefeld and McCauley, 2016; Straka et al., 2016). Evidence also suggests that both the degree and the accuracy of the information provided during the valuation studies may have significant effects on improving the acceptability of sustainable policies (Kearney, 2001). It should be also be mentioned that the information effect has a higher impact when focusing on future environmental risks (Hill and Daniel, 2007), and particularly on risks related to human health (Jalan et al., 2003; Madajewicz et al., 2007; Orset et al., 2015).

When environmental knowledge is limited, public information campaigns can be used to help individuals make more informed choices. Our study aims to evaluate the effectiveness of an information campaign which was designed to improve the knowledge base of citizens on the environmental problems created by plastic bags on the coasts and in the marine environment. The information campaign was completely independent of the survey valuation process. For more than one week, a comprehensive information campaign was undertaken and shortly thereafter, our evaluation study was initiated. The campaign focused on substantially increasing the knowledge of individuals of the impacts of plastic waste on ecosystem services in the marine and coastal environment. In this respect, our study adds to a limited number of studies that have investigated the influence of public information and public awareness campaigns on the participants' WTP for environmental goods and services. In most of these studies it was concluded that public information campaigns have a positive effect on the WTP estimates (e.g. van der Wal et al., 2014; Szabó and Ujhelyi, 2015). The present study aims to contribute by exploring how a public information campaign may affect the stated WTP for programs that protect the marine and coastal environment from plastic waste. By using of a choice experimental method, we trace the effect of the campaign on participants': (a) preferences and willingness to pay (WTP) values for mitigating the various impacts of plastic waste on coastal/marine ecosystem services, as well as their (b) willingness to take individual action to reduce the use of plastic bags.

2. Briefing the economic valuation of plastic waste

Attributing an economic value to the environmental impact is usually important for the evaluation of environmental management policies, especially on marine litter and plastic waste, where dynamic and complex (ecological) processes, with multi-scalar drivers and transboundary impacts are involved. Assigning values to environmental impacts emerges as the necessary condition for the implementation of the "polluter pays principle" as well as for the design of effective sustainability policies (Bithas, 2011). An economic value should reflect the social impacts induced by plastic waste, the way in which it affects peoples' quality of life (Lee, 2015). Impacts may induce either direct or indirect costs. Direct costs induced by the foregone benefits of industries, economic activities (e.g. fishing vessels, leisure craft, commercial shipping, tourism etc.). Indirect costs are associated with pollution effects on non-market assets (e.g. ecological/biological services) of the marine and coastal environment which influences social welfare (McIlgorm et al., 2009). The most frequent impacts of plastic litter relate to: reduced recreational opportunities, loss of aesthetic value, loss of non-use values (existence value, bequest value and altruistic value), environmental damage, ecosystem degradation, public health and safety concerns (National Research Council, 2009).

As the marine environment is a typical example of public goods (Costanza et al., 1997) it is very difficult to estimate the economic losses from marine debris. Only a few case studies are currently available, while most of them address the direct impact on the tourism industry. Ofiara and Brown (1999) appraised that the losses in tourism revenues, as a result of a pollution debris event in 1988 in the New York Bight, in the USA, was $379.1–1597.8 million US$ (in terms of 1987$). The lost tourism revenues of Geoje Island due to marine debris flowing from the Nakdong River were estimated to be 29–37 million US$ (Jang et al., 2014).

Indirect costs reflect welfare losses from impacts on non-market "services" and are defined as: indirect use values, non-use values and option values for one or/and more coastal/marine ecosystem services. Usually these values are estimated through stated preference methods. In these approaches, people's preferences are elicited based on hypothetical, rather than actual, markets described by relevant scenarios. In previous relevant studies, stated preference methods were designed to identify the willingness of households to pay (WTP) to reduce (plastic) litter in the marine or coastal environment. Social costs were estimated on the basis of public perception regarding the impact of littering on the beach/coast experience and by residents' and/or visitors' willingness to contribute: (a) to collective actions (e.g. voluntary beach clean-up activities) or (b) in monetary terms, via paying an entrance fee or a higher local tax. Based on previous findings, the increasing impacts induced by large amounts of plastic waste in the coastal or marine environment are associated with higher WTP values. However, if a certain action is taken and waste disposal is gradually being reduced, households tend to give lower WTP values for further waste reductions (Coe and Rogers, 1997; Faris and Hart, 1994). Furthermore, results from the study of Brouwer et al. (2017) showed that beach visitors placed a significant value on the reduction of marine litter and that these values differ across locations, depending on public perceptions of marine litter and on the socio-economic and demographic profiles of beach visitors.

3. Case study description

The study area is the island of Syros, a representative case of a typical Mediterranean island, situated in the island group of the Cyclades in the center of the Hellenic Aegean archipelagos in Greece (Fig. 1). Located 144 km south-east of Athens, covering an area of 83.6 km^2, Syros is the most populated Cycladic island and the economic, administrative and cultural center of the Cyclades (South Aegean) region. Its proximity and frequent connections to the port of Piraeus, combined with the island's well-developed tourism infrastructure have made Syros a popular tourist destination. The population of Syros is approximately 21,507 inhabitants (2011 Census). Syros has 4200 permanent households and 27 local businesses/SMEs (Cyclades Chamber of Commerce, 2017).

Islands are considered to be a vital part of coastal ecosystems (Lin et al., 2013) since they are described as lands isolated and surrounded by water, with a high proportion of coast to hinterland. Island ecosystems can be particularly sensitive to environmental disturbances, taking into consideration that many recorded extinctions have occurred on islands (Millennium Ecosystem Assessment, 2003).

According to the questionnaire, that we administered on the island in May 2016 (see Section 5.3), the main marine litter source, as stated by local residents and stakeholders, was the inappropriate use and disposal of plastics and particularly of plastic bags by consumers (both residents and tourists). Other important sources are solid waste from landfills, shipping activity (both recreational and commercial) and the operation of a shipyard on the island. The inadequate waste-water treatment and tourism associated activities (beyond the disposal of plastics and plastic bags) were considered less important sources of litter.

An integrated information and awareness raising campaign was conducted on Syros in June 2016. This information campaign aimed at reducing plastic waste - and specifically plastic bag – pollution in the local marine environment. The main objective of this campaign was to improve the knowledge of residents, visitors and stakeholders of the environmental problems caused by plastic bags on the coasts of the island and in the marine environment. By disseminating this knowledge, it was hoped that the behavior of residents could change in

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