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# Economic valuation of coastal water quality and protest responses: A case study in Mitilini, Greece

Nikoleta Jones<sup>a,\*</sup>, Costas M. Sophoulis<sup>a</sup>, Chrisovaladis Malesios<sup>b</sup>

<sup>a</sup> Centre for Environmental Policy and Strategic Environmental Management, Department of the Environment, University of the Aegean, Xenia A, University Hill, GR 81100 Mitilini, Greece

<sup>b</sup> Department of Statistics, Athens University of Economics and Business, 76, Patission Str., GR10434 Athens, Greece

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## Abstract

The aim of this study was to evaluate environmental benefits resulting from the construction of a Sewage Treatment Plant (STP) in Mitilini, Greece. The main benefits identified were the improvement of the coastal water quality and subsequent impacts on citizens' activities. The valuation was conducted using the Contingent Valuation Method (CVM) through the elicitation of individuals' willingness to pay (WTP). Due to the significant amount of zero and protest responses, different measurements of mean WTP were calculated and the need for further research on social factors which influence individuals' valuation is emphasized.

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## 1. Introduction

The Contingent Valuation Method (CVM) is regarded as the main method for the valuation of environmental goods. It was proposed by Ciriacy-Wantrup (1947) and was first applied by Davis (1963) (Mitchell and Carson, 1989). Since its first application the method has rapidly expanded leading researchers to use it for the valuation of several other public goods such as cultural (e.g. Papandrea, 1999; Harless and Allen, 1999; Willis, 2002; Finn et al., 2003; Tohmo, 2004) and

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\* Corresponding author.

E-mail address: jones@env.aegean.gr (N. Jones).

goods related to the health sector (e.g. Philips et al., 1997; Diener et al., 1998; Bishai and Lang, 2000; Sach et al., 2004; Hackl and Pruckner, 2006).

The application of the method consists of the construction of a hypothetical market through which the public good is provided. This hypothetical scenario is included among other elements in a questionnaire which is distributed to the population concerned. The other elements of the questionnaire are several questions concerning attitudes towards the good being valued and also a valuation question. The latter takes the form of either a willingness to pay (WTP) or a willingness to accept (WTA) a certain amount for an improvement or degradation in the quality of an environmental or public good. Through the elements investigated in the questionnaire, the researcher may design a function and a curve which explains the main indicators influencing the valuation of the individual and, in addition, results in a mean amount of the sample which can be generalized to the population and is regarded as the final valuation. The majority of CVM studies evaluate the benefits, through a WTP question, that derive from an improvement in the quality of an environmental good.

During the application of a CV study the researcher should be informed of the several biases which may occur (see Freeman, 1986; Mitchell and Carson, 1989). Nevertheless, there is extensive literature concerning ways that these biases may be avoided (e.g. Bateman and Turner, 1995; Mitchell and Carson, 1989) thus securing to a large degree the reliability of CVM studies. One common problem during the investigation of the WTP for the valuation of a public good is how to handle the data arising from individuals who are unwilling to pay any amount for the good being valued. In such circumstances, some individuals do not value certain public goods or are unable to declare any amount due to budget constraints. On the other hand, such attitudes may be attributed to ‘strategic behavior’ or even ‘protest responses’ towards some element of the scenario (Freeman, 1986; Mitchell and Carson, 1989).

In the case study presented, the primary aim was to evaluate the benefits deriving from the improvement of the sea water quality around the city of Mitilini due to the construction of a Sewage Treatment Plant (STP). Consequently, future use values were evaluated as the results from such a project will not be visible until a few years after the completion of the STP. Due to a high percentage of respondents who were unwilling to pay any amount, a second aim of the study was to extract a valid willingness to pay by utilizing different econometric methods. In addition the need for further research on the possible social factors which influence the valuation of individuals, and consequently the application of the CVM, is highlighted.

The article is divided in four sections. The first part constitutes a description of the research area and the good being valued, while in Section 2, the methodology and instruments used are presented. In the third part, attitudes towards the STP and environmental issues are briefly described and also the level of acceptance of the scenario and protest responses, are analyzed. Finally, Section 4 deals with the various techniques for the extraction of a valid amount of average WTP, the bid equation of the model selected and the aggregate valuation of the environmental good.

## **2. The research area**

Mitilini is the capital of Lesbos, the third biggest island of Greece, and is located in the Northeast Aegean Sea. Over the last decades, the population of Mitilini has greatly increased to its present level of approximately 30,000 inhabitants. The change in the population resulted in an increase in the production of sewage which was not however accompanied by new sewage treatment facilities, both for domestic and industrial purposes. Instead, a large percentage of the sewage was discharged unprocessed in the sea area near the city. In order to confront the

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