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Valuing the non-market benefits arising from the implementation of the EU Marine Strategy Framework Directive

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ABSTRACT

This paper uses the choice experiment methodology to estimate the value of the non-market benefits associated with the achievement of good (marine) environmental status (GES) as specified in the EU Marine Strategy Framework Directive (MSFD). The MSFD requires that the 'costs of degradation' (the benefits foregone if GES is not achieved) be considered within a broader 'Economic and Social Assessment' of the marine environment by EU member states. Assessing the costs of degradation as defined by the MSFD implies that changes in marine ecosystem services provided in each State should be analysed. The results show that there are high values attached with changes to the state of the marine environment by the Irish general public. The results of a random parameters logit model also demonstrate that preferences are heterogeneous, with changes in certain marine attributes generating both positive and negative utilities.

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1. Introduction

The European Union (EU) adopted the Marine Strategy Framework Directive (MSFD) (EC, 2008) in February 2008. The Directive is aimed at achieving, or maintaining, good environmental status (GES) of Europe's marine and coastal waters, as measured by 11 descriptors, by the year 2020. Article 8.1 (c) of the Directive calls for 'an economic and social analysis of the use of those waters and of the cost of degradation of the marine environment'. This element of the directive will therefore require member states to estimate the value associated with changes in the environmental state of their marine waters that come about as a result of the implementation of the MSFD. As pointed out by Turner et al. (2010), the MSFD is 'informed' by the Ecosystem Management Approach, with GES interpreted in terms of ecosystem functioning and services provision. It is considered to be the first attempt to undertake an ecosystem management approach to protect and maintain the marine environment while ensuring that marine-based activities are sustainable (Long, 2011). This ecosystem approach can also be considered a more holistic approach toward water body management compared to what has been perceived as a more prescriptive approach taken by previous water body related directives such as the EU Water Framework Directive (WFD) (EC 2000), Bathing Water Directive (CEC, 1976) and the Urban Waste Water Directive (CEC, 1991) (Borja et al., 2010).

Marine and coastal waters provide a variety of benefits to society generated through ecosystem goods and services (Ledoux and Turner, 2002). Some of these goods are valued by the market (such as fishing and aquaculture) but others, which are still valuable to society, are not captured by the market. These non-market goods and services are valued for the regulating functions they provide such as carbon sequestration, waste treatment and storm and flood protection in addition to cultural values such as recreation, aesthetic values and spiritual values (TEEB, 2010). These non-use values attached to the marine environment are considered to be a significant proportion of the total economic value of the benefits arising from the introduction of the MSFD (Bertram and Rehdanz, 2012) and substantial non-use values have been noted for changes to a broad range of environmental goods (Stevens et al., 1991, Bateman and Langford, 1997). TEEB (2010) also identifies non-use values that are not captured by the market and instead can only be estimated through the use of stated preference techniques such as contingent valuation (CV) and choice experiment (CE) methodologies.

Through the use of such stated preference techniques, estimates can be made of the additional non-market ecosystem service benefits that implementing the MSFD may provide.[1]

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[1] Hynes et al. (2013a) and Brenner et al. (2010) used value transfer to estimate the value of various marine and coastal ecosystem goods and services within Galway Bay on the West coast of Ireland and the Catalan Coast respectively. These

Different economic valuation methodologies can be used to value non-market benefits accruing from the implementation of a marine environmental policy by assessing the public's willingness to pay for the outputs from such a policy as a whole or by modelling the preferences of society for the change in the component ecosystem services that result from the implementation of the policy. CE, for example, deal more explicitly with how society values relate to individual marine ecosystem related attributes, and combinations of attributes, while the CV method takes a more holistic approach by focusing on the value of (inter alia) moving from the status quo policy situation to an alternative where the marine environment is enhanced under a marine environmental policy. While both CV and CE can be used to estimate the value of improving the status of the marine environment, the CE approach has the advantage of being capable of measuring the marginal value of a change in the individual marine ecosystem services that are impacted by the policy (e.g. separate marginal values of improvement to benthic health, of enhanced recreation opportunities and of sustainable fish stocks) while a CV can usually only be used to value of the final specified change (e.g. value of achieving GES in marine waters) in the marine environment.

It should be noted that primary non-market valuation studies have previously been undertaken in connection with a number of EU policies concerned with coastal and marine ecosystem services. Georgiou et al. (2004) undertook a CV exercise examining the benefits of coastal water bodies meeting the EC Directive on Bathing Water (CEC, 1976), and the ecosystem service values resulting from changes to the same Directive were examined using a choice experiment by Hynes et al. (2013b). Elsewhere, Östberg et al. (2012) undertook a CV study examining coastal water quality, boat noise and litter in coastal waters. These studies show that stated preference techniques using primary valuation methodologies can play a crucial role in helping policymakers to implement EU directives within the aquatic environment (i.e. revised Bathing Water Directive (EC 2006), the WFD and the MFSD). Further offshore, Armstrong et al. (2012) present a categorisation and synthesis of deep-sea ecosystem goods and services, and review the current state of human knowledge about these services, the possible methods of their valuation and possible steps forward in its implementation.

Elsewhere, Eggert and Olsson (2009) used a CE with the attributes of coastal cod stock levels, bathing water quality levels and biodiversity levels to estimate the values of changes in these aspects of a coastal marine ecosystem. Examining the offshore ocean, Jobstvogt et al. (2014) used CE to estimate the values attached to additional marine protected areas in the Scottish deep-sea which included attributes for deep-sea biodiversity and the potential of new medicinal products. McVittie and Moran (2010) also used a CE to estimate the non-use values associated with the introduction of marine conservation areas within the UK. The attributes in that study included biodiversity, environmental benefits (such as CO_2 sequestration, water treatment and recreation) and restrictions to fishing and marine extractive industries. The authors argued that non-use values compose a large segment of the values associated with changes to marine environment due to their spatial remoteness relative to other ecosystems.

A number of studies have also attempted to analyse the diversity within the marine and coastal ecosystem service valuation literature. Remoundou et al. (2009), for example, undertook a review of valuation studies related to coastal and marine goods within the Black Sea and Mediterranean regions; he found thirteen relevant studies. Most of the studies were undertaken using the CV method ($n=6$) while two valuations used the CE method. They noted that further valuations are needed both for use and non-use marine and coastal goods and the potential for valuations to assist with policy and governance related to these resources. In another more recent paper, Ghermandi and Nunes (2013) examined the welfare impact of the recreational services provided by coastal ecosystems. The authors constructed a global database of primary valuation studies that focus on recreational benefits of coastal ecosystems and then build a meta-analytical framework using a Geographic Information System that allowed for the exploration of the spatial dimension of the valued ecosystems, including the role of spatial heterogeneity of the selected meta-regression variables.

Valuation studies have also been carried out that examine the non-market benefits associated with the implementation of the WFD. Bateman et al. (2009), for example, used CV across five northern European countries to estimate the increased welfare associated with improvements in river water quality. Elsewhere, Brouwer et al. (2010) used a CE to value improvements in water quality in Spain while Hanley et al. (2006) and Stithou et al. (2012) used a CE to estimate values associated with improved river ecology in catchments in the UK and Ireland respectively.

In this paper, we add to the above literature by using the CE methodology to estimate the value of the non-market ecosystem service benefits associated with the achievement of good (marine) environmental status (GES) as specified in the EU Marine Strategy Framework Directive (MSFD). A novel feature of this research is that the measures of meeting the MSFD, namely the 11 GES descriptors outlined within the Directive, were used to generate the attributes used in this CE. As such, this paper presents the results of the first study to attempt to value the 'Cost of Degradation' of the marine environment as set out in the MSFD. In what follows, Section 2 provides a description of the MSFD and briefly reviews the requirements for the valuation of marine ecosystem services within the directive. Section 3 then describes the CE methodology that is used to estimate the value of achieving GEV in Irish marine waters. Section 4 discusses the generation of the choice attributes and levels used in the application of the CE and other details related to the survey instrument. Section 5 presents the results and some discussion and conclusions are presented in Section 6.

2. The Marine Strategy Framework Directive

In trying to balance the demands on the marine environment with ensuring the sustainability of marine resources for future generations, the EU has put in place the Marine Strategy Framework Directive (MSFD) (2008/EC/56). The directive establishes a legally binding framework within which Member States shall take the necessary measures to achieve or maintain good environmental status in the marine environment by the 2020 at the latest. It is similar in scope and objectives to the Water Framework Directive (WFD) (2000/60/EC) and provides a framework model for achieving its aims rather than following a prescriptive approach. The MSFD allows for the interaction of plans with the WFD where there is coastal zone water bodies covered by both directives (but not transitional waters). The MSFD therefore complements the efforts of the WFD within the coastal zone.

The MSFD requires that EU member states (MSs) achieve GES in their waters by protecting, maintaining and preventing deterioration of the marine ecosystems and by preventing polluting inputs being introduced into the marine environment (Art. 1). This is to be achieved by developing and implementing strategies (Art. 5.1)

(*footnote continued*)
studies demonstrated that coastal and marine ecosystems generate large benefits but such secondary techniques are dependent upon a constant flow of primary estimates for these values, which in the case of marine ecosystem services are relatively scarce.

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